

MINI-MAX/ARM9260-E
MINI-MAX/ARM9G20-E
MINI-MAX/ARM9XE512-E
Single Board Computers
Technical Manual

Date: 28 July, 2010

Document Revision: 1.04



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MINI-MAX/ARM9 Single Board Computer Technical Manual. No part of this work may be reproduced in any manner without written permission of BiPOM Electronics.

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BiPOM Electronics warrants MINI-MAX/ARM9 for a period of 1 year . If the board becomes defective during this period, BiPOM will at its option, replace or repair the board. This warranty is voided if the product is subjected to physical abuse or operated outside stated electrical limits. BiPOM Electronics will not be responsible for damage to any external devices connected to MINI-MAX/ARM9. BiPOM Electronics disclaims all warranties express or implied warranties of merchantability and fitness for a particular purpose. In no event shall BiPOM Electronics be liable for any indirect, special, incidental or consequential damages in connection with or arising from the use of this product. BiPOM Electronics' liability is limited to the purchase price of this product.

1. Overview

MINI-MAX/ARM9 is a general purpose, low-cost and highly-expandable micro-controller system. It is based on the ATMEL AT91SAM9260-CU single-chip ARM Thumb Flash micro-controller. This micro-controller features:

- Program execution speed up to 200 MIPS at 180MHz
- 8 Kbyte Data Cache, 8 Kbyte Instruction Cache,
- 8 Kilobytes bytes of SRAM
- 32 Kilobytes bytes of ROM
- Programmable 16 bit Watchdog Timer (WDT)
- 32-bit Real-Time Timer (RTT)
- 20-bit Interval Timer and 12-bit Timer Counter (RIT)
- Two Three-channel 16-bit Timer/Counters (TC) provides of a Double PWM Generation.
- Ethernet MAC 10/100 Base-T
- Image Sensor Interface
- USB 2.0 Full Speed (12 Mbit per Second) Device Port
- USB 2.0 Full Speed (12 Mbit per Second) Dual Host Port
- 4 Programmable Enhanced UART Serial Interfaces
- Two 2-wire UART's
- Two Master/Slave Serial Peripheral Interface (SPI)
- Two-wire Interface (TWI) with I²C features
- 4-channel 10-bit ADC with external Reference Voltage input
- Peripheral DMA controller
- 96 Programmable I/O Lines Multiplexed with up to Two Peripheral I/Os
- Two-slot Multimedia Card Interface (MCI)
- Real time In-System debug support through JTAG Interface

AT91SAM9G20-CU (64K PM, 96K RAM, 400MHz, 217-LFBGA) and AT91SAM9XE512-CU (512K Flash, 32K RAM, 217-LFBGA) are supported also.

MINI-MAX/ARM9 board complements these features and provides

- 64-Mbyte (16Mx32) SDRAM (MT48H16M32LFCM-75)
- 8-MByte SPI DATAFLASH (AT45DB642D-CNU)
- 10/100 Mbit Ethernet port
- Two USB host ports and one USB device port
- Two RS232 serial ports
- Analog terminals (4 analog inputs, 3V reference, 3.3V analog power)
- 18-bit parallel port for an external 320x240 QVGA MTF-TQ24NN731-LB color LCD
- Image sensor connector
- Micro-SD holder
- 3V battery holder for real-time clock
- Configurable (either 3.3V or 5V levels) expansion slot to connect low-cost peripheral boards
- 2.1mm power jack for 8-24VDC external power source
- In-circuit Programming and debugging of the micro-controller through the JTAG Interface using 20-pin JTAG connector (Only on the MINI-MAX/ARM9XE512-E)

The Flash micro-controller can be programmed through USB or JTAG. This simplifies new program development and debugging. Downloading of a program to the micro-controller typically takes few seconds.

MINI-MAX/ARM9 is powered from a 8-24 Volt DC external power source through the power connector. Current consumption is less than 120mA at 12 Volt DC.

Software examples for MINI-MAX/ARM9 are available from www.bipom.com

2. Specifications

MINI-MAX/ARM9 board has the following configuration:

- AT91SAM9260-CU micro-controller with 16 Kbytes RAM and 32 Kbytes ROM
- MT48H16M32LFCM-75 64-Mbyte (16Mx32) SDRAM,
- AT45DB642D-CNU 8-MByte SPI DATAFLASH
- 10/100 Mbit Ethernet port
- Two Host USB Ports with 5V signals for Full Speed (12 Mbit per Second) down stream data communications
- Device USB Port for Full Speed (12 Mbit per Second) up stream data communication
- 8-pin Micro-CD holder
- 10-pin terminal block for 3 analog inputs, +3V reference output and Vdd 3.3V output
- 20-pin Expansion connector for peripheral boards
(http://www.bipom.com/periph_cat/44/0.html)
- 20-pin JTAG Port connector for In-circuit Programming and a real time debugging In-circuit Programming and debugging of the micro-controller through the JTAG Interface using 20-pin JTAG connector only on the MINI-MAX/ARM9XE512-E
- 2.1mm power jack for 8-24VDC external power source
1.5 W maximum supply consumption.
- On-board 5.0V and 1.8V DC/DC.
- On-board linear regulators:
3.3 Volt regulator,
1.8 Volt regulator for AT91SAM9XE512 version or
1.2 V and 1.0 V regulators for AT91SAM9G20 version
- Dimensions are 2.35 X 2.40 inches (5.97 X 6.10 centimeters).
- Mounting holes of 0.138 inches (3.5 millimeters) are on four corners.
- 0° - 70° C operating, -40° - +85° C storage temperature range.

3. Functional Blocks

Figure 1 shows the block diagram of the MINI-MAX/ARM9 board

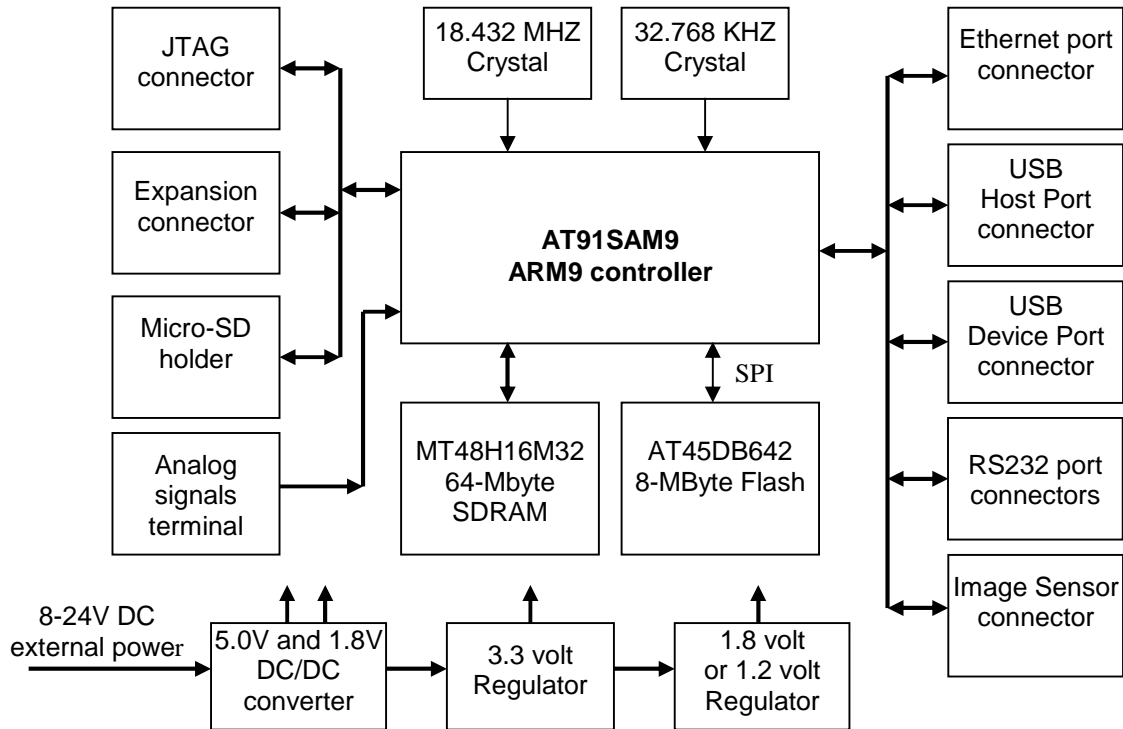


Figure 1

Expansion connector

Control signals and 5 Volt power supply output are available on 20-pin connector (X1) for interfacing to peripheral boards. A peripheral board can be connected to MINI-MAX/ARM9 board either as a piggyback daughter-board using standoffs or can be placed away from the micro-controller board using a 20-wire ribbon cable (Part #: EXPCABLE-6).

Table 1 shows the pin assignments for the X1 connector:

Expansion Connector (X1)

Signal	Pin	Pin	Signal
RXD2	20	19	TXD0
RXD4	18	17	MISO
SCK	16	15	CS
TXD4	14	13	MOSI
IO1	12	11	IO0
DRXD	10	9	DTXD
IO3	8	7	IO2
I2C SCL	6	5	I2C SDA
Not connected	4	3	GND
VCC (+5V)	2	1	Not connected

Table 1

JTAG Port connector

JTAG port is available on a 20-pin male connector X4.

Table 2 shows the pin assignments for the JTAG port connector:

JTAG Port Connector (X4)

Pin	Name	Signal
1, 2	VDD	3.3V Power Output
3	TRST	Test Reset Input
5	TDI	Test Data Input
7	TMS	Test Mode Select Input
9	TCK	Test clock Input
11	RTCK	Return test clock Input
13	TDO	Test Data Output
15	NRST	Target CPU Reset Input/Output
17,19	-	Not Connected (NC)
4,6,8,10,12, 14,16,18,20	GND	GND

Table 2

LCD Module Connector

Various Liquid Crystal Displays such as Microtips Technology 240×320 dots MTF-TQ24NN731-LB can be connected directly to MINI-MAX/ARM9.

Table 3 shows the pin assignments of the LCD connector:

LCD Connector (X6)

Pin	Name	Signal
39	3.3V	Power supply for logic voltage
38	3.3V	Power supply for analog voltage
37,36	GND	Power ground
35	LCS0	Chip Select Input
34	LRS	Data/Instruction select Input
33	LWE	Write execution control input
32	LRD	Read execution control input
14 ... 31	LD17 ... LD0	Data input bus
13	LRES	Reset Signal Input Pin
12	GND	Power ground
11	3.3V	Power supply for logic voltage
6 ... 10	G5 ... G1	No connect
5	LED_K4	Power supply for White LED(-)
4	LED_K3	Power supply for White LED(-)
3	LED_K2	Power supply for White LED(-)
2	LED_K1	Power supply for White LED(-)
1	5V	Power supply for White LED(+)

Table 3.

Image Sensor Connector

Table 4 shows the pin assignments for the image sensor connector:

Image sensor connector (X10)

Pin	Name	Signal
30	5V	Power supply
29	ISID11	Data input
28	ISID10	Data input
27	ISID9	Data input
26	ISID8	Data input
25	ISID7	Data input
24	ISID6	Data input
23	ISID5	Data input
22	ISID4	Data input
21	ISID3	Data input
20	ISID2	Data input
19	ISID1	Data input
18	ISID0	Data input
16	ISIPCK	Data clock input
15,17	GND	Power ground
14	ISIHS	Horizontal Synchro input
12	ISIVS	Vertical Synchro input
10	ISIMCK	Reference clock output
9,11,13	GND	Power ground
8	ISISDA	I2C data
7	ISISCL	I2C clock
6	ISICT1	Control 1
5	ISICT2	Control 2
4	ISICT3	Control 3
3	ISICT4	Control 4
2	1.8V	Power supply
1	3.3V	Power supply

Table 4.

Analog Input Connector

Table 5 shows the pin assignments for the analog input connector:

Analog Input Connector (X14)

Name	Signal	Pin
Va	+3.3V Output	1
AGND	Analog Ground	2
WKUP	Active low "Wake Up" digital input	3
VREF	+3V Output	4
AN3	Analog input 3	5
AGND	Analog Ground	6
AN2	Analog input 2	7
AGND	Analog Ground	8
IO2I	Digital Input/Output	9
AN0	Analog input 0	10

Table 5

UART Connectors

Tables 6 and 7 shows the pin assignments for the UART0 and UART1 connectors

UART0 Connector (X15)

Name	Signal	Pin
NC	Not Connected	1,2
RXD_0	Data input	3
RTS_0	Request to Send output	4
TXD_0	Data output	5
CTS_0	Clear to Send input	6
NC	Not Connected	7, 8,10
GND	Ground	9

Table 6.

UART1 Connector (X16)

Name	Signal	Pin
RXD_1	Data input	1
CTS_0	Clear to Send input	2
GND	Ground	3
NC	Not Connected	4
TXD_1	Data output	5
RTS_0	Request to Send output	6

Table 7.

USB Device connector

Standard Type Mini 'B' Right Angle Receptacle connector is used for USB Device bus.

USB Connector (X8)

Name	Signal	Pin
VBUS	+5V Power input	1
D-	Data (-)	2
D+	Data (+)	3
GND	Ground	5
SGND	Shield	6,7,8,9

Table 8.

USB Host connector

Standard Type 'A' Dual Right Angle Receptacle connector is used for the USB Host bus.

USB Connector (X12)

Name	Signal	Pin
USB_P1	+5V Power output	1
D1-	Data (-)	2
D1+	Data (+)	3
GND	Ground	4
USB_P2	+5V Power output	5
D2-	Data (-)	6
D2+	Data (+)	7
GND	Ground	8
SGND	Shield	9,10,11,12

Table 9.

Jumpers

Tables 10 and 11 show the jumper assignments:

Jumpers J1, J2, J3

Name	Signal	1 and 2 pins closed	2 and 3 pins closed
J1	Vcc	5V	3.3V
J2	ERASE	MCU Flash memory erase	MCU Flash work mode
J3	OSCSEL	32768 Hz Oscillator is used	Internal RC Oscillator is used

Table 10

Jumpers J4 ... J7

Name	Signal	If removed	If installed
J4	VddCORE	1.0V MCU Core power	1.8V MCU Core power
J5	EGND	Free Ethernet ground	Connected to GND
J6	CGND	Free Ethernet shield	Connected to GND
J7	VddUSB	Disabled USB device power	Enabled USB device power
X2	VDDBU Source	Regulated 3.3V	Battery
X5	JTAG TCK	TCK not connected to RTCK	TCK connected to RTCK
X11	SPI Flash DFCS	Chip select disabled	Chip select enabled
X13	SPI Flash DFWP	Page write disabled	Page write enabled

Table 11

Power Supply

An external supply should be able to provide 1.5W power at 8...24 Volts DC through the 2.1mm power jack X3.

4. Application Notes

The SAM Boot Assistant (SAM-BA) software is used for a programming of MM-ARM9 through USB interface. It runs under Windows 2000 and XP.
<http://www.atmel.com>

A peripheral board can either be stacked on top of MINI-MAX/ARM9 using stand-offs or connected in a chain configuration using flat ribbon cable. Figure 2 shows how DAC-2 peripheral board can be connected to a Micro-Computer board in a stacked fashion. Figure 3 shows the chain connection.

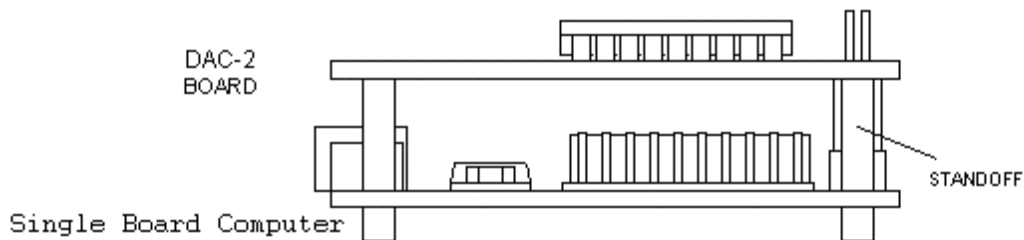


Figure 2

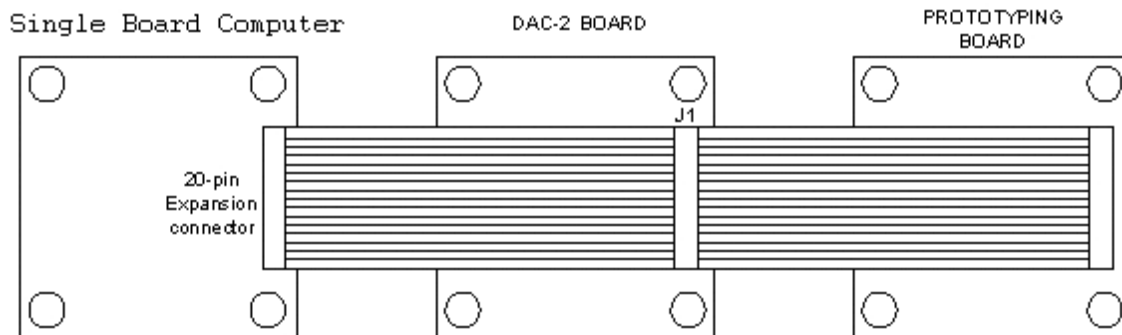


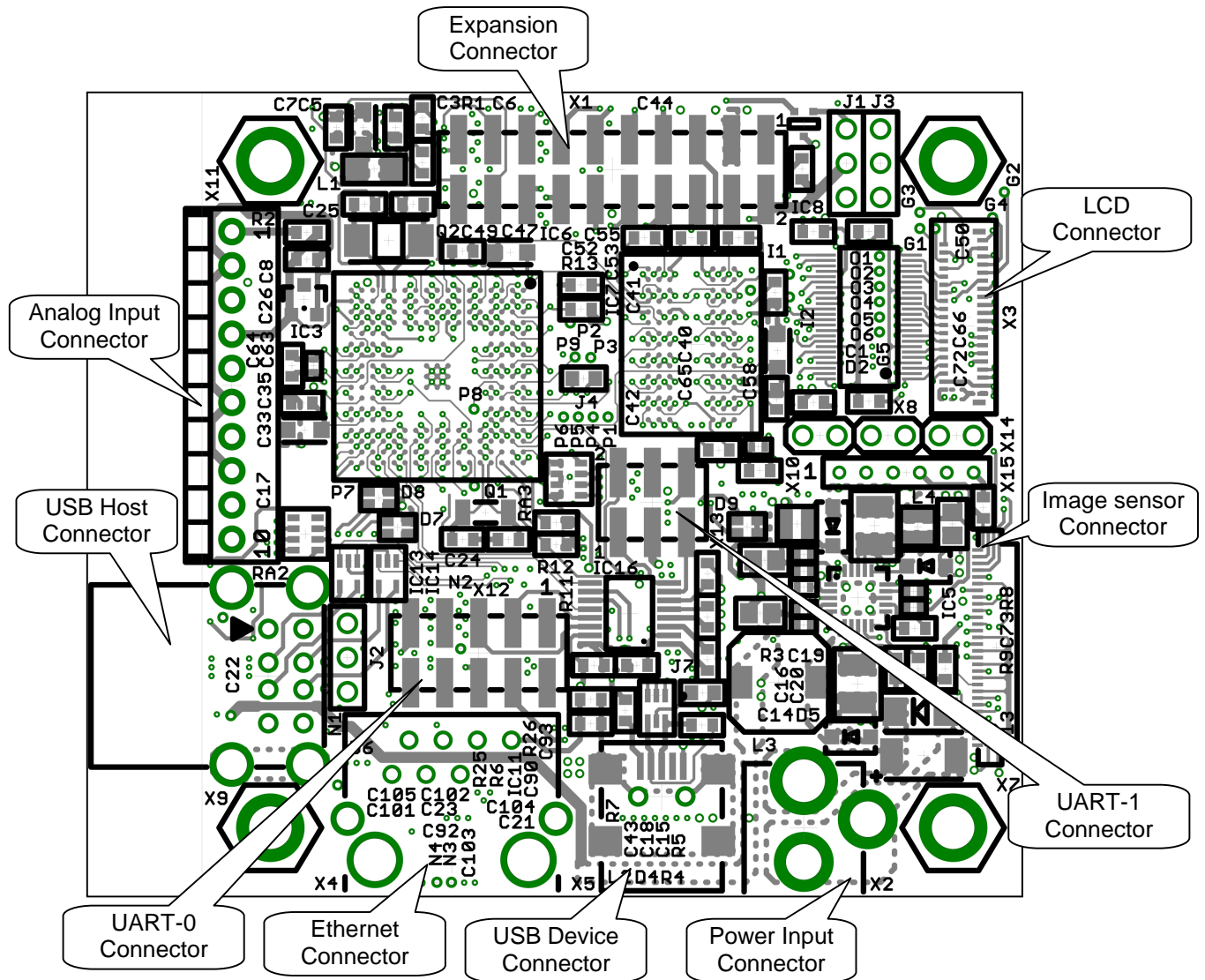
Figure 3

More details concerning BiPOM Peripheral boards are available from:
http://www.bipom.com/periph_cat/44/0.html

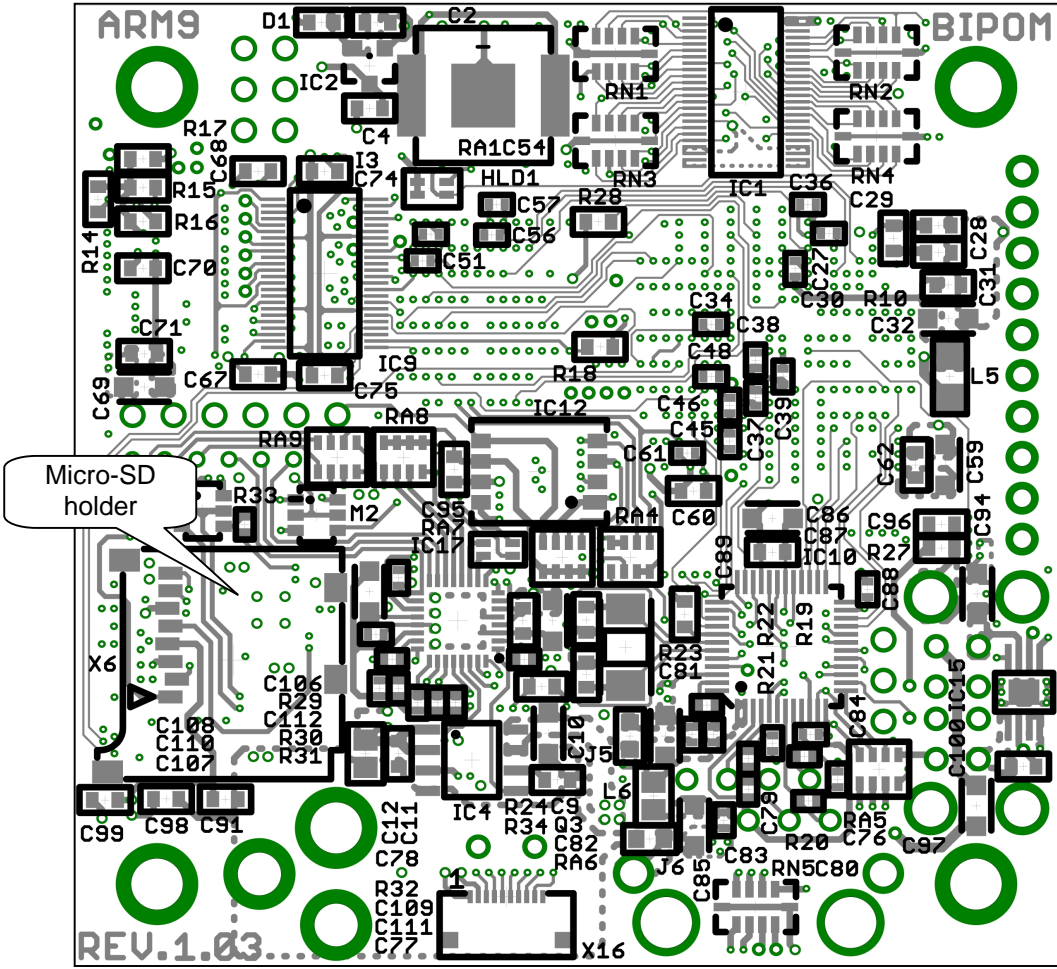
ARM Development System provides examples for MINI-MAX/ARM9.
Please download ARM Development System from:
<http://www.bipom.com/armdev.php>

5. Board Layout

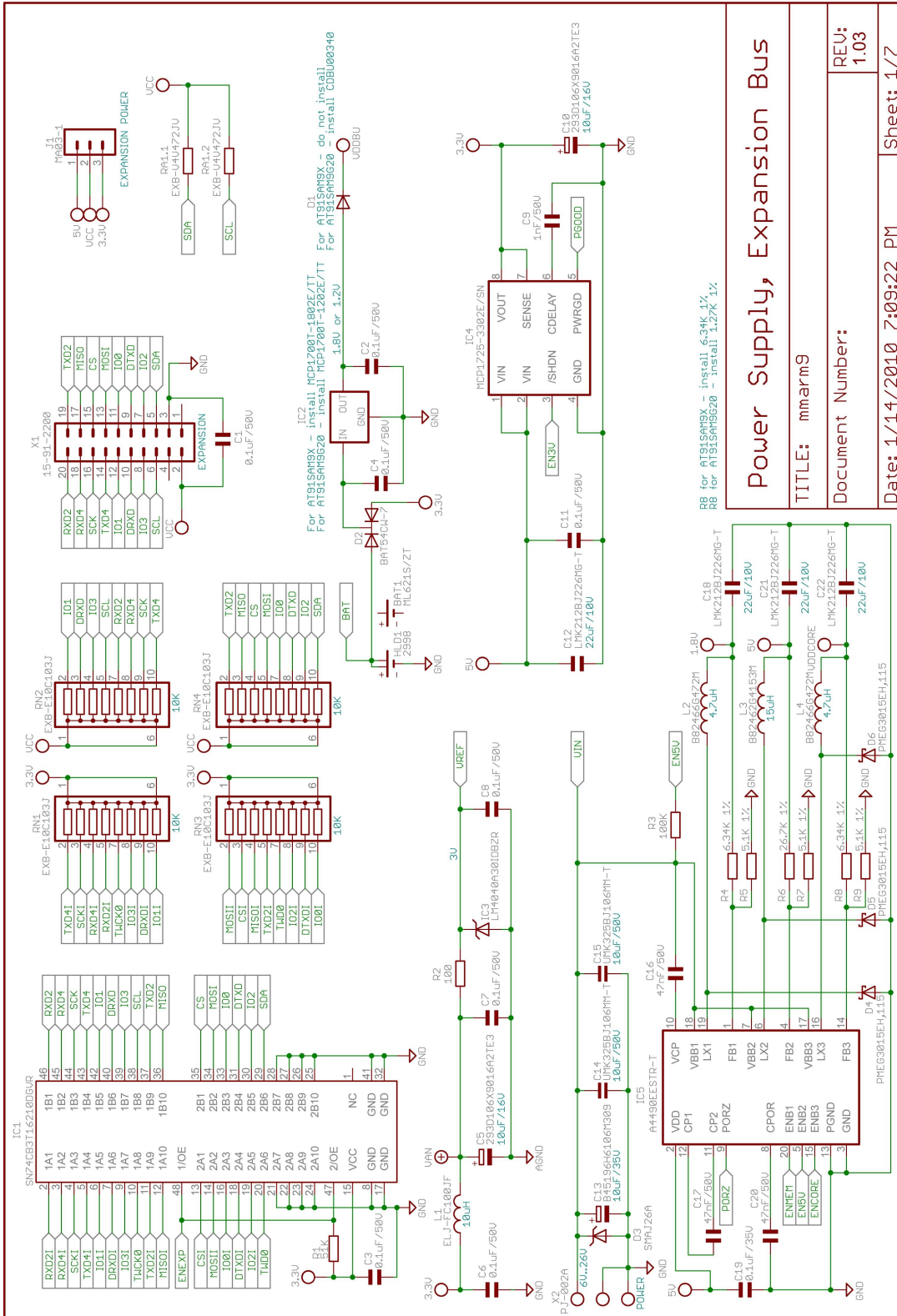
Top view of the MINI-MAX/ARM9 board is shown below:

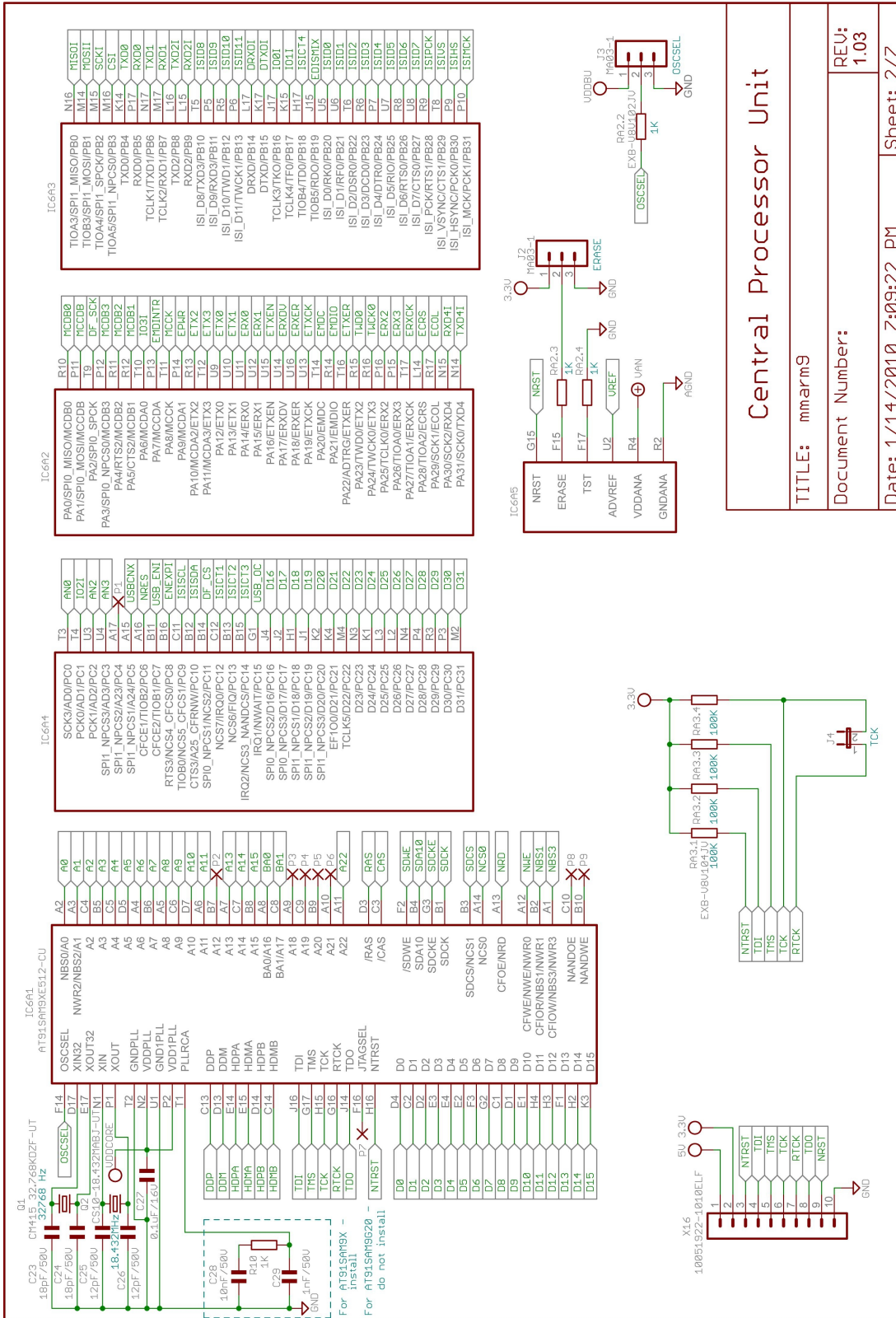


Bottom view of the MINI-MAX/ARM9 board:



6. Schematics





Central Processor Unit

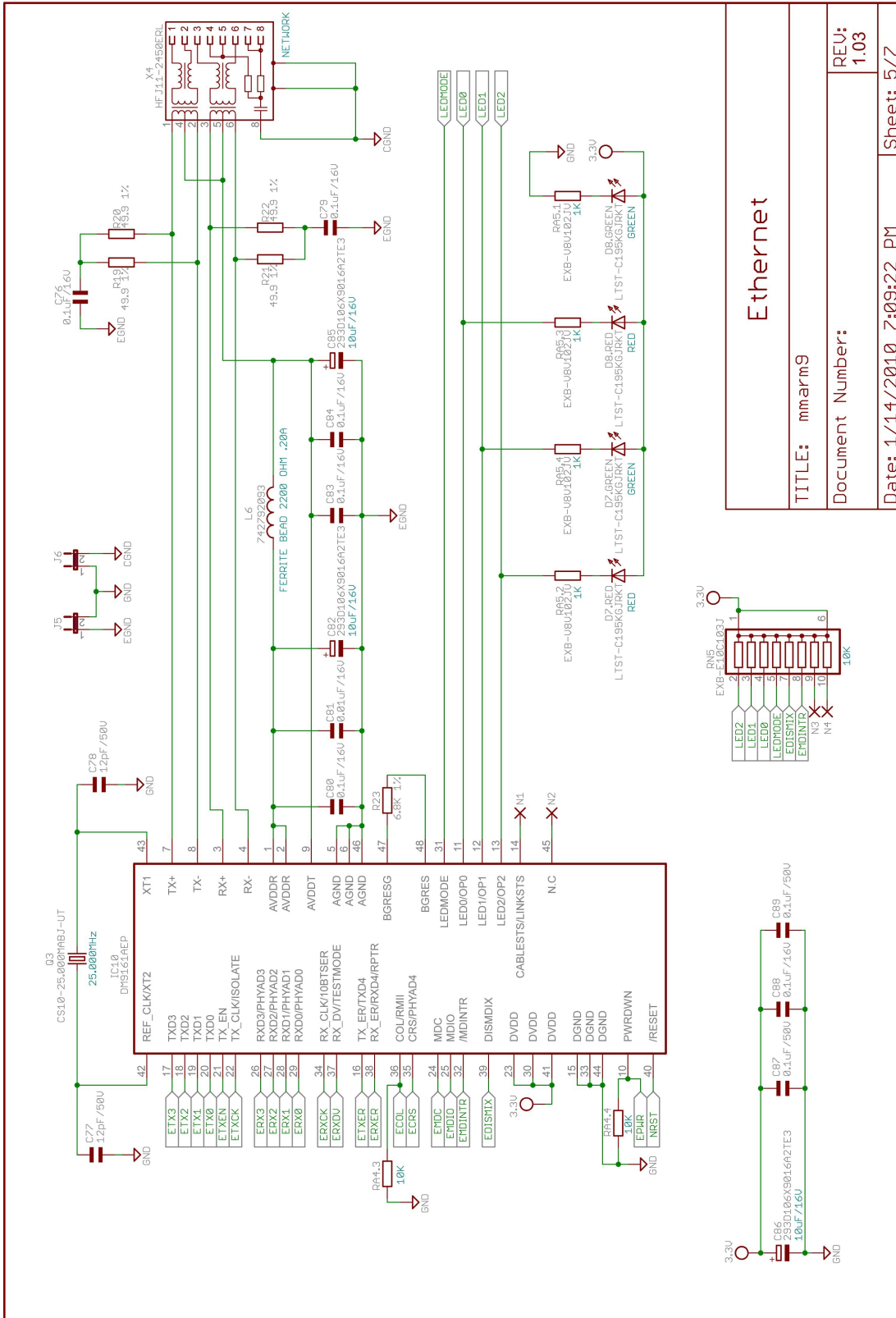
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Ethernet

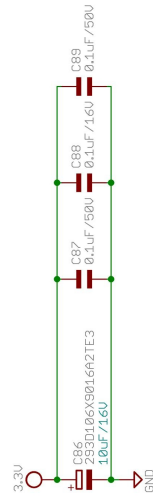
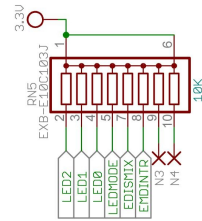
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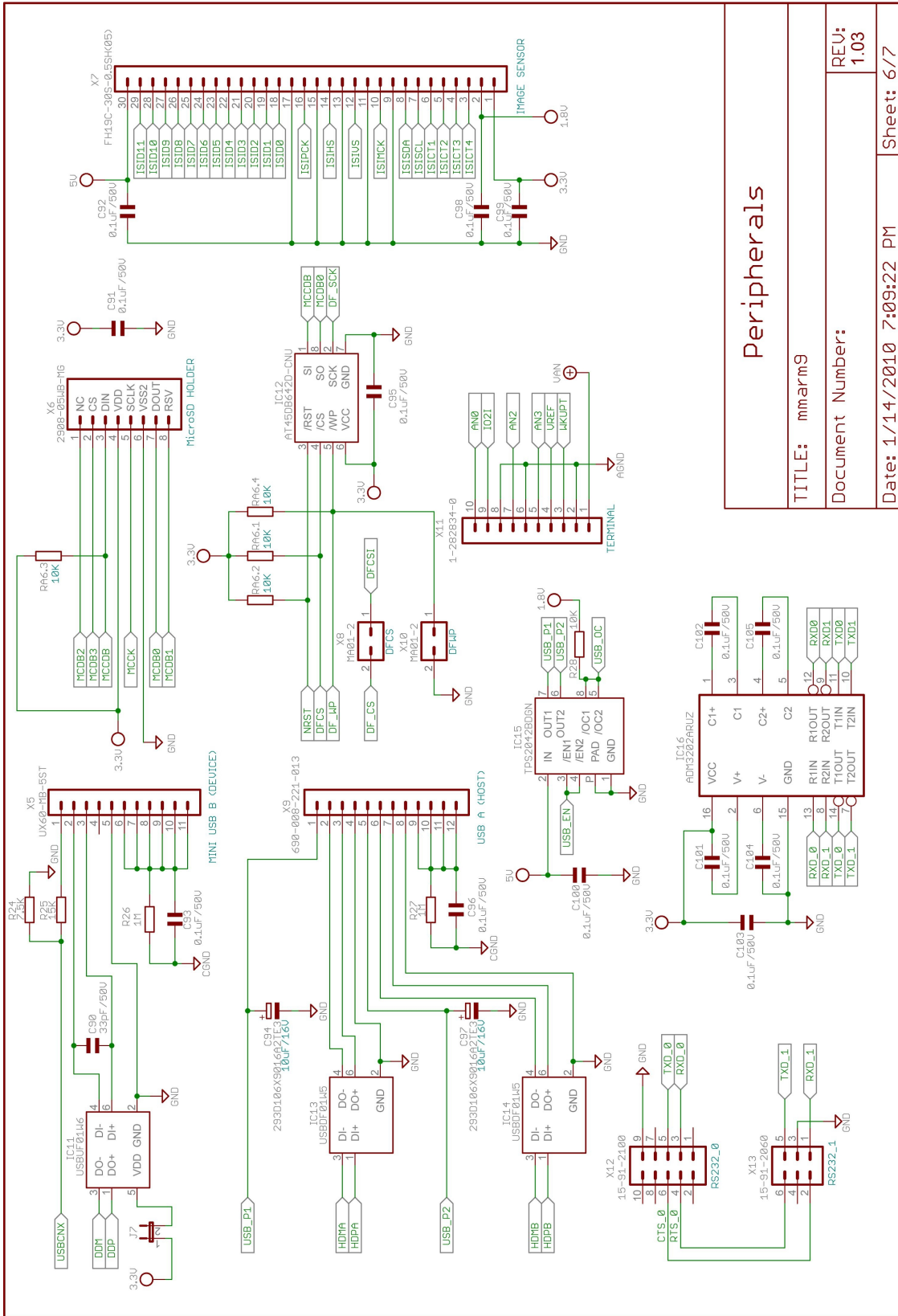
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Peripherals

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