

# **AT91RM9200-EK Evaluation Board**

.....

## **User Guide**







## Table of Contents

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### Section 1

Overview .....	1-1
1.1 Scope .....	1-1
1.2 Deliverables .....	1-2
1.3 The AT91RM9200-EK Evaluation Board .....	1-3

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### Section 2

Setting Up the AT91RM9200-EK Evaluation Board .....	2-1
2.1 Electrostatic Warning .....	2-1
2.2 Requirements .....	2-1
2.3 Powering Up the Board .....	2-1
2.4 Getting Started with the AT91RM9200 .....	2-1

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### Section 3

Board Description .....	3-1
3.1 AT91RM9200 Processor .....	3-1
3.2 Memory .....	3-2
3.3 Memory Card .....	3-2
3.4 Clock Circuitry and Analog Functions .....	3-2
3.5 Reset Circuitry .....	3-2
3.6 Power Supply Circuitry .....	3-2
3.7 Remote Communication .....	3-2
3.8 User Interface .....	3-2
3.9 Expansion Slot .....	3-3
3.10 Debug Interface .....	3-3
3.11 Wrapping User Area .....	3-3

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### Section 4

Configuration Straps .....	4-1
4.1 Configuration Straps and Jumper Settings .....	4-1

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### Section 5

Schematics .....	5-1
5.1 Schematics .....	5-1

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### Section 6

Errata .....	6-1
6.1 Errata .....	6-1
6.1.1 SD/MMC Card slot communication problem .....	6-1



# Section 1

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## Overview

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### 1.1 Scope

The AT91RM9200-EK Evaluation Board enables real-time code development and evaluation. It supports the AT91RM9200 ARM9™-based 32-bit RISC microcontroller.

This guide focuses on the AT91RM9200-EK Evaluation Board as an evaluation and demonstration platform:

- Section 1 is this overview.
- Section 2 gives information on setting up the installation.
- Section 3 contains a description of the development board.
- Section 4 details the configuration straps.
- Section 5 shows board schematics.
- Section 6 contains errata.

## 1.2 Deliverables

The development kit is delivered with:

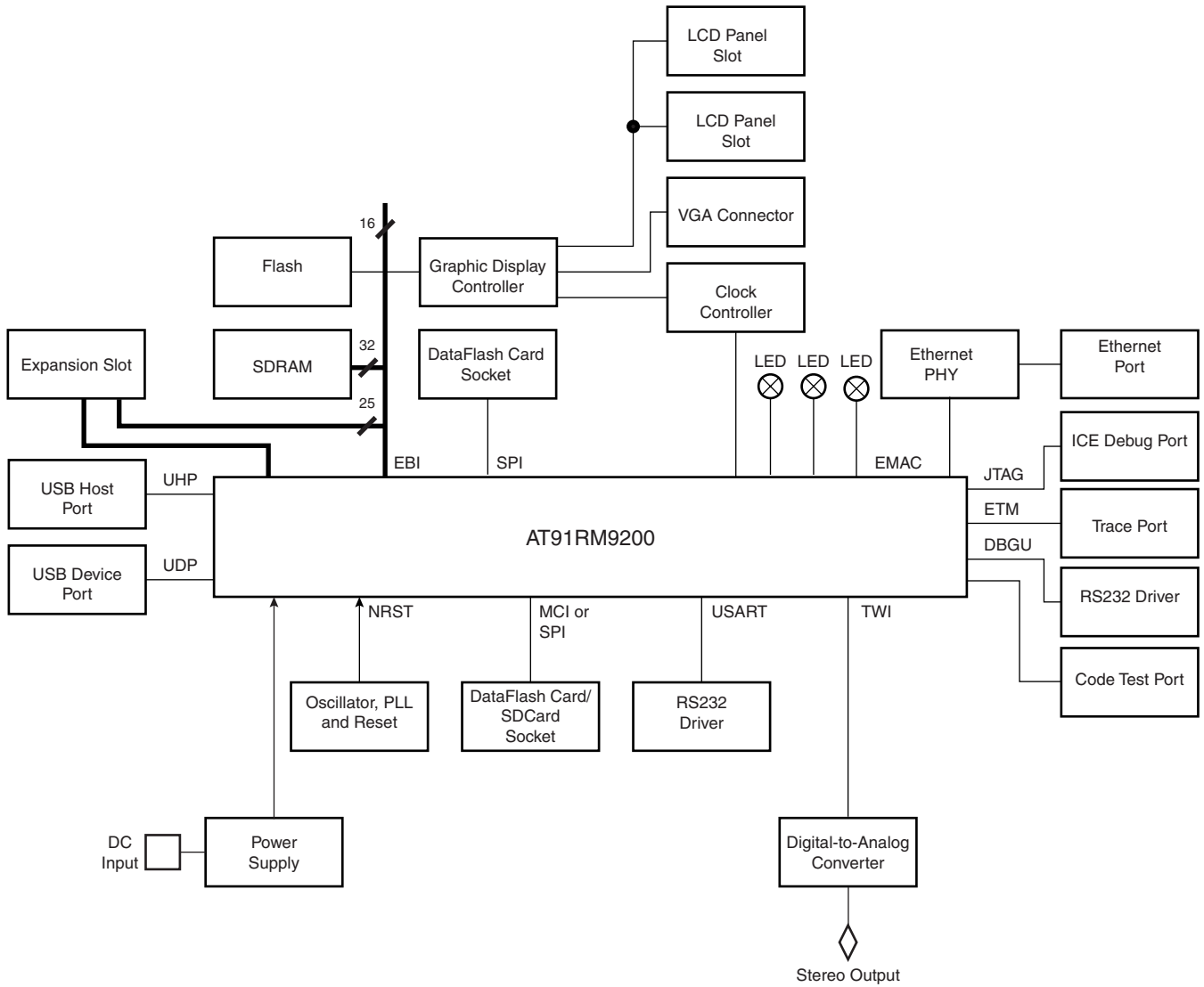
- One AC adapter 100 - 240V ~ 1.2A, 12V, 50 - 60 Hz with adapters
  - One modem RS232 cable
  - One RJ45 Ethernet crossed cable
  - One A/B-type USB cable
  - One AT91 DVD-ROM containing summary and full datasheets, datasheets with electrical and mechanical characteristics, application notes and getting started documents for all development boards and AT91 microcontrollers. An AT91 software package with C and assembly listings is also provided. This allows the user to begin evaluating the AT91 ARM<sup>®</sup> Thumb<sup>®</sup> 32-bit microcontroller quickly.
  - CD ROMs from third parties, providing solutions for operating system evaluation
  - DataFlash<sup>®</sup> Cards to provide demonstrations of operating systems when inserted in the bootable slot
- Note:** To boot on a DataFlash Card:
- Ensure J15 (BMS) is set on position 1-2
  - Insert the DataFlash Card in the J200 socket (bottom side)
  - Reset the board

Further details are given on the AT91 DVD-ROM.

**Note:** These deliverables are subject to change without notice.

- 
- 1.3 The AT91RM9200-EK Evaluation Board**
- The board consists of an AT91RM9200 together with the following:
- 8 Mbytes of parallel Flash memory
  - Four banks of 2M x 32-bit SDRAM
  - DataFlash<sup>®</sup> or SD/MMC memory expansion socket
  - Additional DataFlash memory expansion socket
  - Digital-to-Analog Converter (DAC) for a stereo audio signal
  - Four communication ports (USB host and device, Ethernet, serial and DBGU)
  - Graphic controller with output to a standard VGA monitor
  - JTAG/ICE, ETM and code test port interface
  - Expansion connector
  - Onboard prototype area

Figure 1-1. AT91RM9200-EK Evaluation Board Block Diagram







## Section 2

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# Setting Up the AT91RM9200-EK Evaluation Board

- 
- |            |  |  |
|------------|--|--|
| <b>2.1</b> | <b>Electrostatic Warning</b>               | The AT91RM9200-EK Evaluation Board is shipped in protective anti-static packaging. The board must not be subjected to high electrostatic potentials. A grounding strap or similar protective device should be worn when handling the board. Avoid touching the component pins or any other metallic element.   |
| <b>2.2</b> | <b>Requirements</b>                        | In order to connect the AT91RM9200-EK Evaluation Board, the following element is required: <ul style="list-style-type: none"><li>■ The AT91RM9200-EK Evaluation Board itself</li></ul>   |
| <b>2.3</b> | <b>Powering Up the Board</b>               | DC power is supplied to the board via the 2.1 mm socket (J1). The polarity of the power supply is not critical. The minimum voltage required is 7V.<br><br>The board has three voltage regulators providing 1.8V, 3.3V and 5V. The regulators allow the input voltage range to be from 7V to 12V.  |
| <b>2.4</b> | <b>Getting Started with the AT91RM9200</b> | The AT91RM9200-EK Evaluation Board is delivered with a DVD-ROM containing all necessary information and step-by-step procedures for working with the most common development tool chains. Please refer to this DVD-ROM, or to the AT91 web site, <a href="http://www.atmel.com/products/AT91/">http://www.atmel.com/products/AT91/</a> for the most up-to-date information on getting started with the AT91RM9200. |





## Section 3

# Board Description

- 
- 3.1 AT91RM9200 Processor**
- Incorporates the ARM920T™ ARM® Thumb® Processor
    - 200 MIPS at 180 MHz
    - 16-KByte Data Cache, 16-KByte Instruction Cache, Write Buffer
    - Memory Management Unit
    - In-circuit Emulator including Debug Communication Channel
    - Mid-level Implementation Embedded Trace Macrocell™
  - Additional Embedded Memories
    - 16K Bytes of SRAM and 128K Bytes of ROM
  - External Bus Interface (EBI)
    - Supports SDRAM, Static Memory, Burst Flash, Glueless Connection to CompactFlash®, SmartMedia® and NAND Flash
  - System Peripherals:
    - Enhanced Clock Generator and Power Management Controller
    - Two On-chip Oscillators with Two PLLs
    - Very Slow Clock Operating Mode and Software Power Optimization Capabilities
    - Four Programmable External Clock Signals
    - System Timer Including Periodic Interrupt, Watchdog and Second Counter
    - Real-time Clock with Alarm Interrupt
    - Debug Unit, Two-wire UART and Support for Debug Communication Channel
    - Advanced Interrupt Controller with 8-level Priority, Individually Maskable Vectored Interrupt Sources, Spurious Interrupt Protected
    - Seven External Interrupt Sources and One Fast Interrupt Source
    - Four 32-bit PIO Controllers with Up to 122 Programmable I/O Lines, Input Change Interrupt and Open-drain Capability on Each Line
    - 20-channel Peripheral DMA Controller (PDC)
  - Ethernet MAC 10/100 Base-T
  - USB 2.0 Full Speed (12 M-bits per second) Host Double Port and Device Port

- MultiMedia Card Interface (MCI)
- Three Synchronous Serial Controllers (SSC)
- Four Universal Synchronous/Asynchronous Receiver/Transmitters (USART)
- Master/Slave Serial Peripheral Interface (SPI)
- Two 3-channel, 16-bit Timer/Counters (TC)
- Two-wire Interface (TWI)
- IEEE 1149.1 JTAG Boundary Scan on All Digital Pins

- 
- 3.2 Memory**
- 8-Mbyte parallel Flash memory
  - Four banks of 2M x 32-bit SDRAM

- 
- 3.3 Memory Card**
- SD Card/MMC
    - Supports MultiMedia and SD Card
    - Analog switches provide support for DataFlash<sup>®</sup> Card
  - Additional DataFlash Card Socket

- 
- 3.4 Clock Circuitry and Analog Functions**
- 32.768 kHz standard crystal for the AT91RM9200
  - 18.432 MHz standard crystal for the AT91RM9200
  - 50 MHz CMOS oscillator for the Display Controller and Ethernet PHY

- 
- 3.5 Reset Circuitry**
- Reset Controller

- 
- 3.6 Power Supply Circuitry**
- 5V DC/DC converter
  - 3.3V DC/DC converter
  - 1.8V Linear regulator

- 
- 3.7 Remote Communication**
- Fast Ethernet Physical Layer Single Chip Transceiver
  - Host Interface via RS-232 DB9 male socket
  - Debug Port via RS-232 DB9 connector
  - Host and Device USB socket

- 
- 3.8 User Interface**
- Graphic Display Controller
  - TFT/SNT panel socket

- 15-pin standard socket for an external VGA monitor
- Three LEDs managed via general PIO lines
- Stereo Audio Jack connected to a DAC

---

**3.9 Expansion Slot** ■ The expansion slot gives access to all the microcontroller's signals.

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**3.10 Debug Interface**

- 38-pin trace Port socket (ETM)
- 38-pin Code Test port socket
- 20-pin JTAG ICE interface connector
- Serial Debug Unit

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**3.11 Wrapping User Area** ■ Onboard prototype area allowing the developer to fit additional components.





## Section 4

# Configuration Straps

### 4.1 Configuration Straps and Jumper Settings

Table 4-1 gives details on configuration straps and jumper settings on the AT91RM9200-EK Evaluation Board and their default settings.

**Table 4-1.** Configuration Straps and Jumper Settings

Designation	Default Setting	Feature
J13	Closed	Available for measuring VDDCORE current.
J15	1 - 2	The AT91RM9200 boots from internal ROM and can also boot from external SPI DataFlash <sup>®</sup> connected on NPCS0.
	2 - 3	The AT91RM9200 boots from Flash memory connected on NCS0.







# Section 5

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## Schematics

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### 5.1 Schematics

This section contains the following schematics:

- AT91RM9200-EK Board Layout, Rev. 63PC042262A01 - Top View
- AT91RM9200-EK Board Layout, Rev. 63PC042262A01 - Bottom View
- Power Supply
- AT91RM9200 Chip
- Debug
- SDRAM and Flash
- RMI Ethernet
- Stereo Audio DAC
- Serial Interfaces
- VGA Display
- Expansion Connector

Figure 5-1. AT91RM9200-EK Board Layout, Rev. 63PC042262A01 - Top View

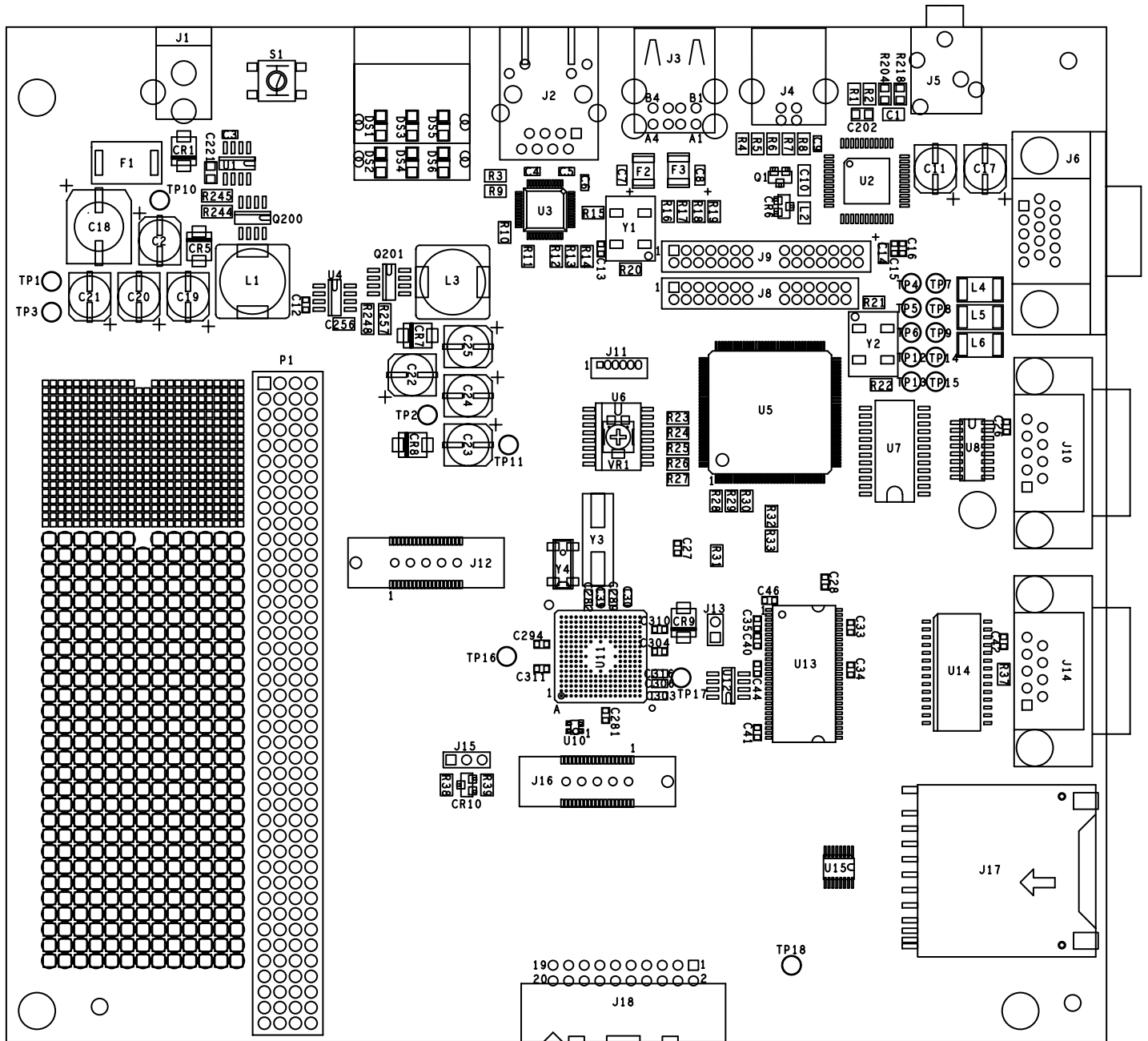
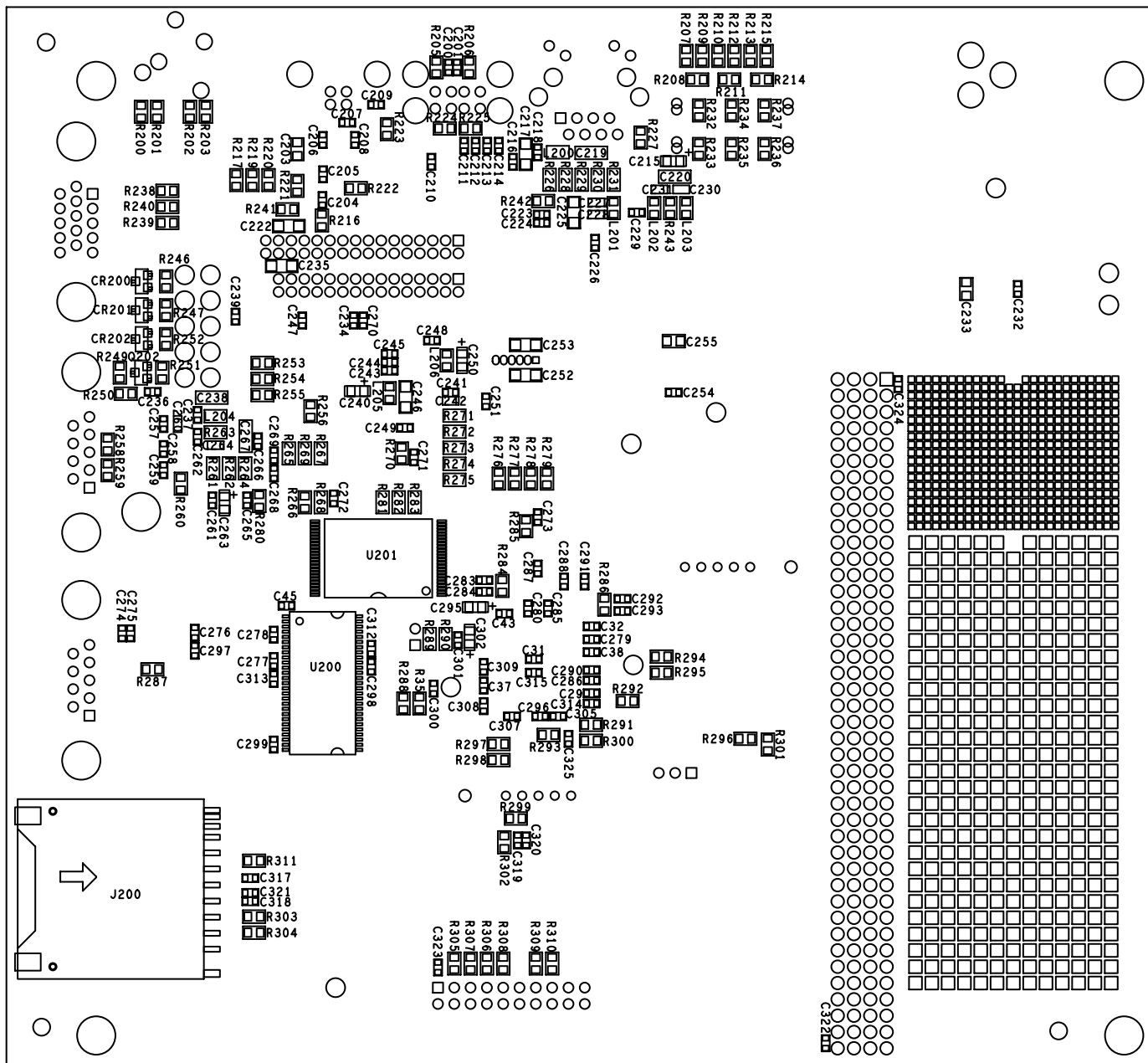
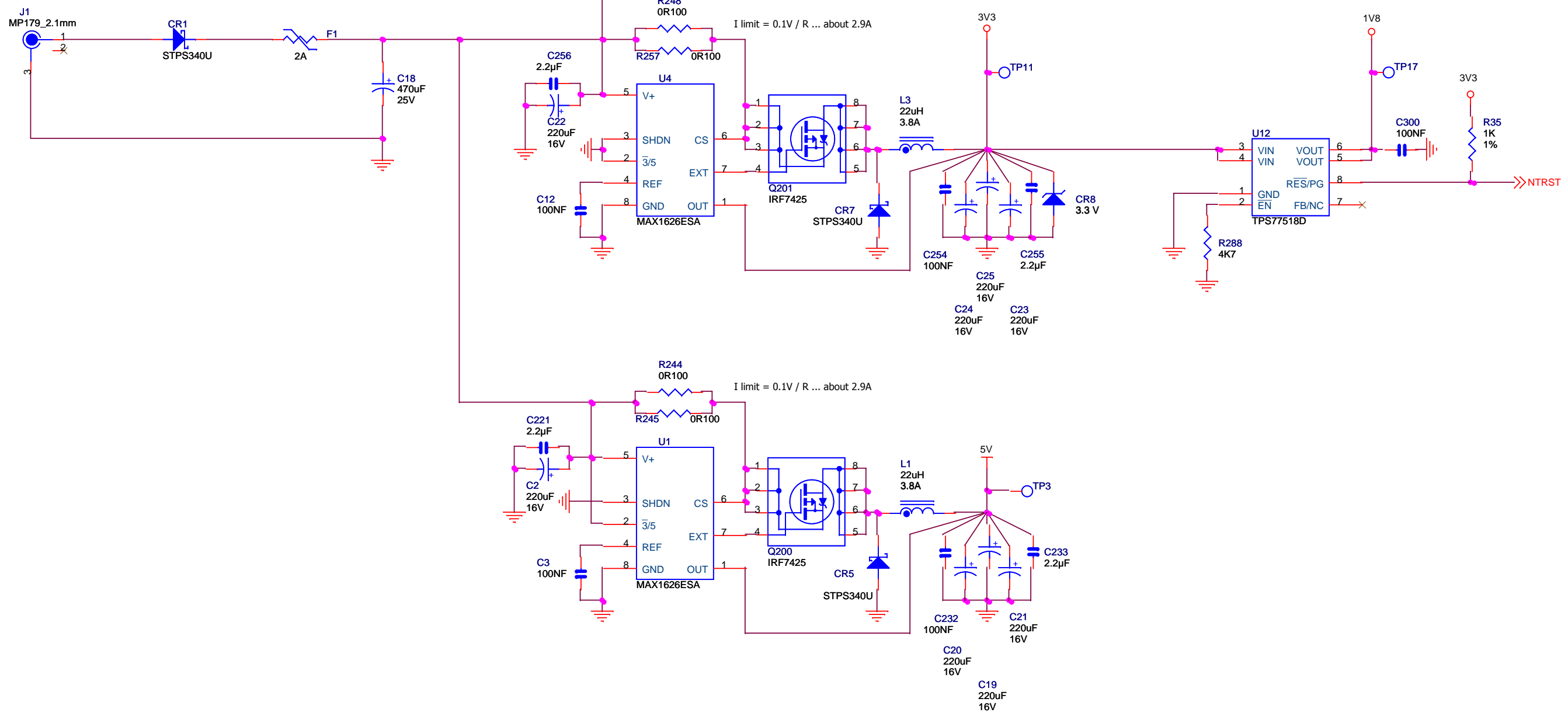


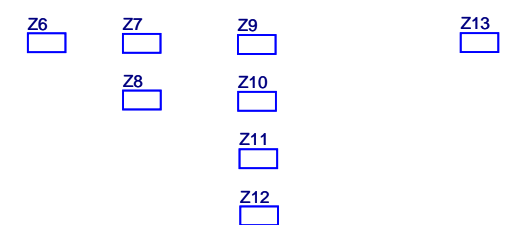
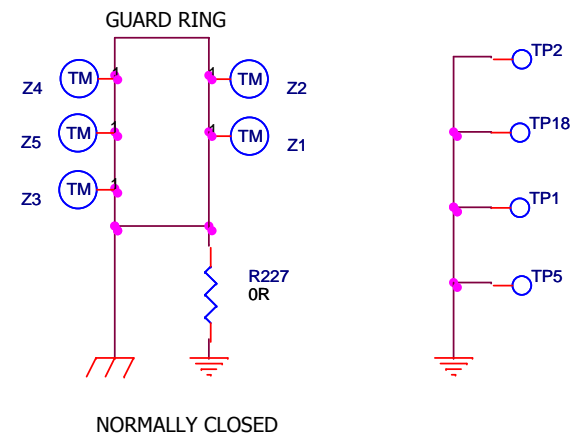
Figure 5-2. AT91RM9200-EK Board Layout, Rev. 63PC042262A01 - Bottom View



12V DC INPUT



Z3 - Z5 are mounting holes.  
The Z reference designators  
are not listed on the actual  
board.



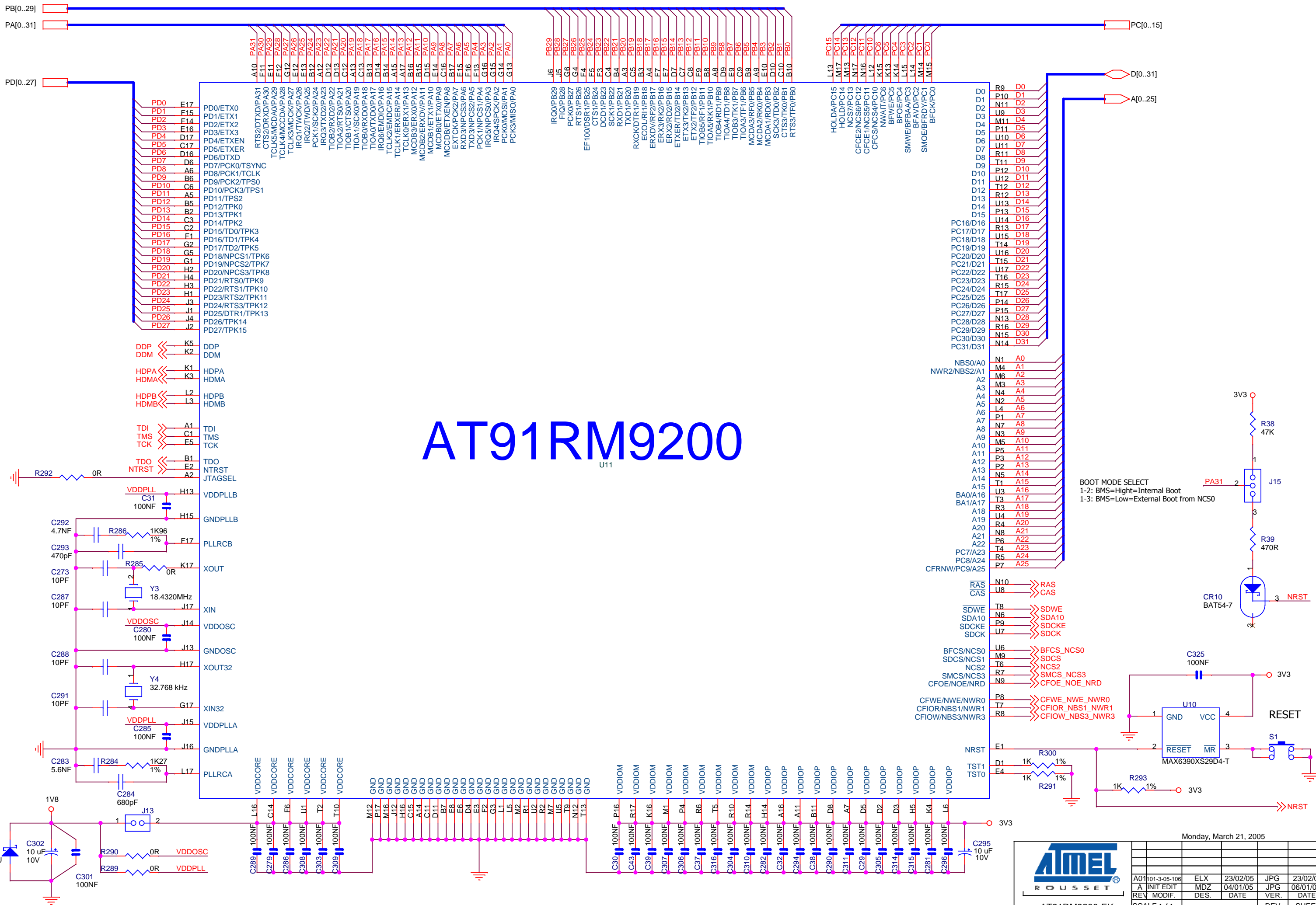
Wednesday, February 23, 2005

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REV	MODIF.	DES.	DATE	VER.	DATE
B	101-3-05-106	ELX	23/02/05	JPG	23/02/05
A	INIT EDIT	MDZ	04/01/05	JPG	06/01/05
AT91RM9200-EK		SCALE 1/1		REV.	SHEET 1/9
POWER SUPPLY		63SC042261		A01	

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# AT91RM9200

U11

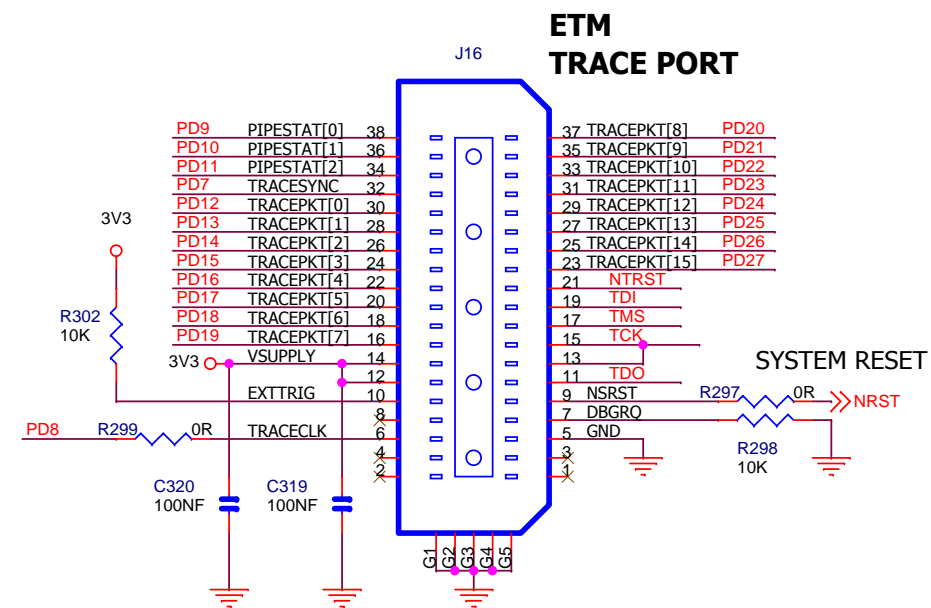
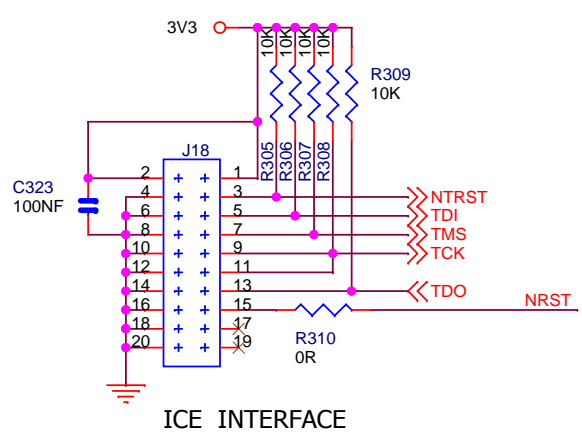
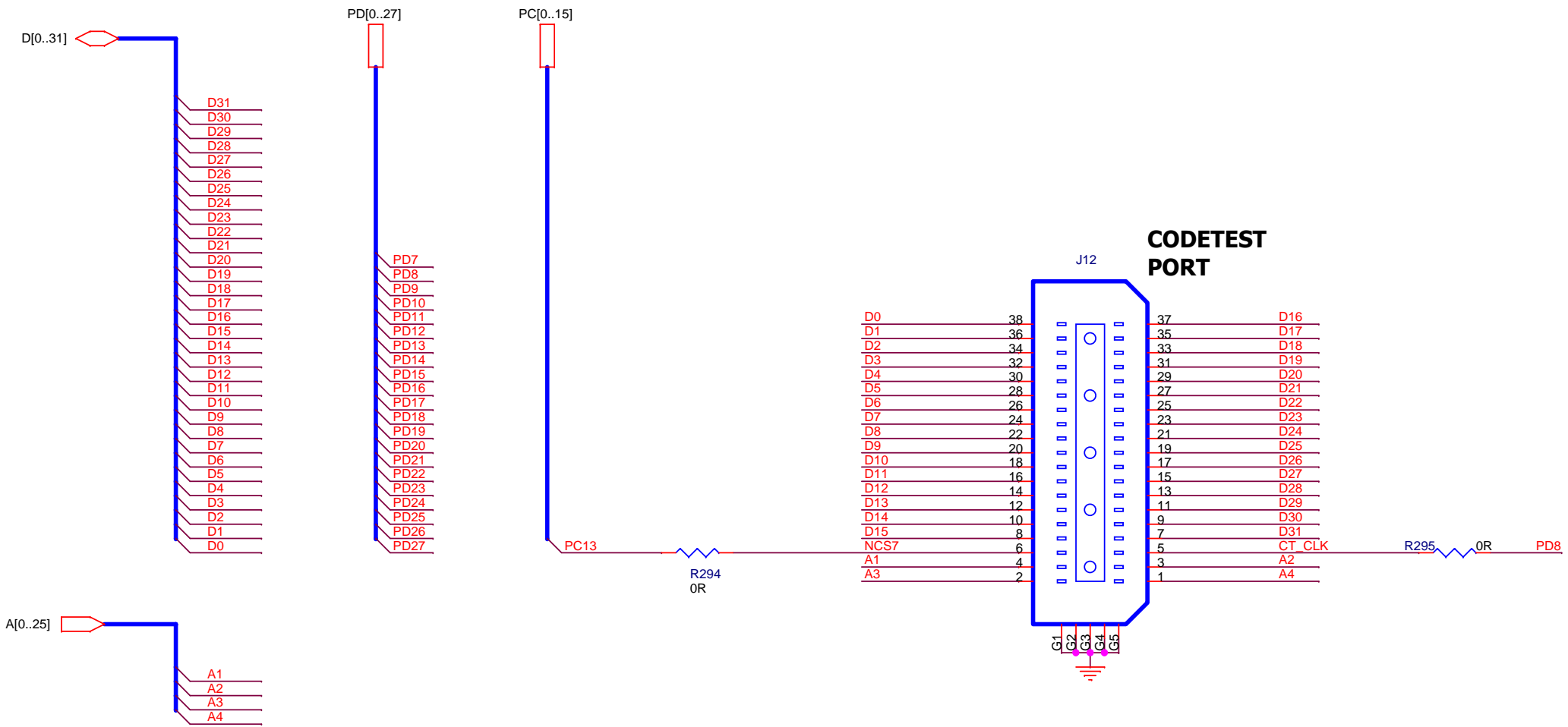


BOOT MODE SELECT  
1-2: BMS=High=Internal Boot  
1-3: BMS=Low=External Boot from NCS0

Monday, March 21, 2005

<b>ATMEL</b> ROUSSET			
A01101-3-05-106	ELX	23/02/05	JPG
A INIT EDIT	MDZ	04/01/05	JPG
REV	MODIF.	DES.	DATE
SCALE 1/1			REV.
AT91RM9200-EK		63SC042261A01	
AT91RM9200		SHEET 2/9	

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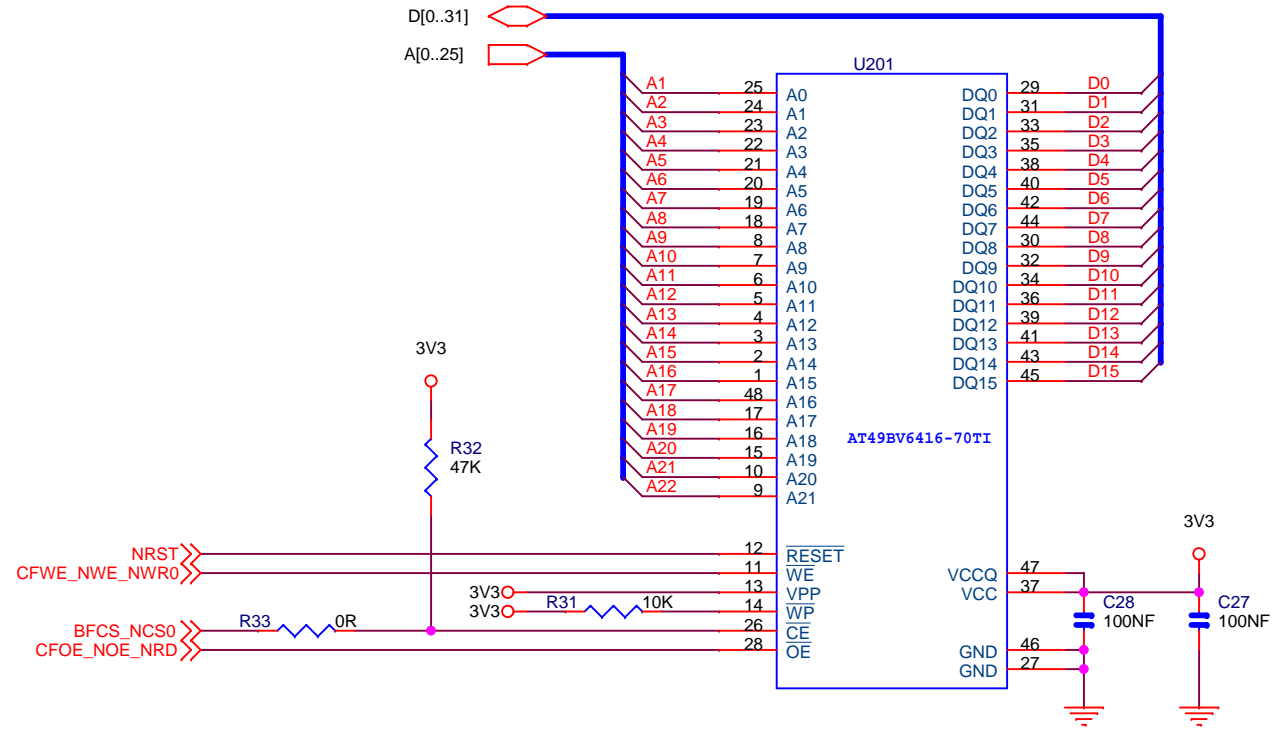
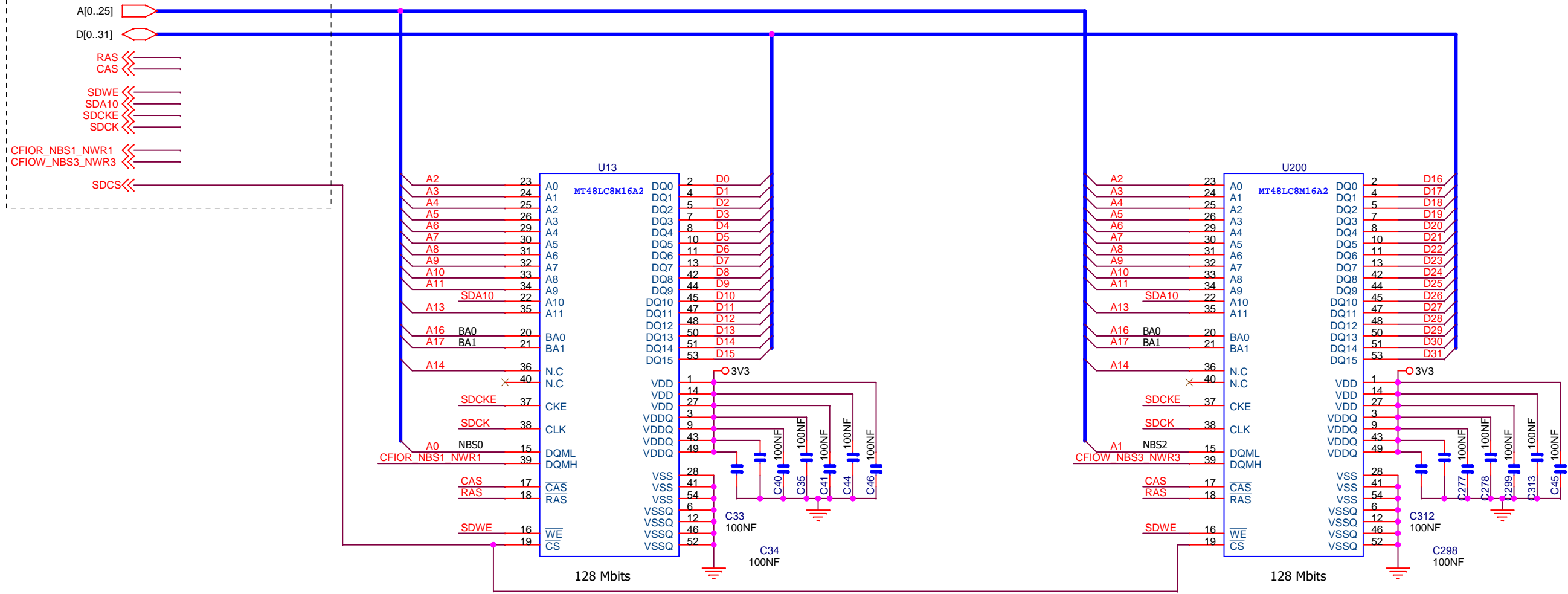


Monday, March 21, 2005

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AT91RM9200-EK		REV	MODIF.	DES.	DATE	VER.	DATE
ETM - ICE - TEST		SCALE	1/1	63SC04226		REV.	SHEET
				A01		3/9	

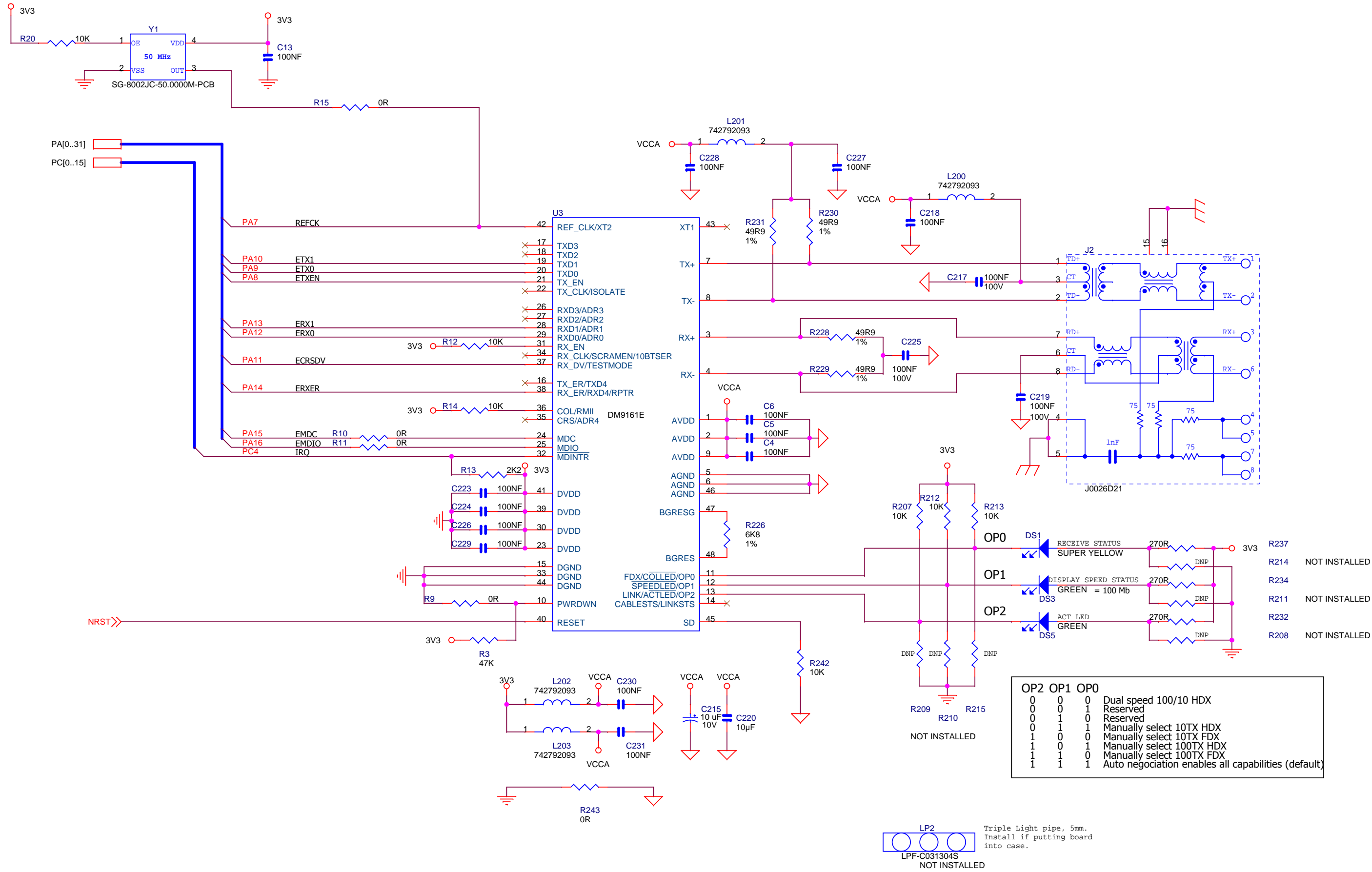
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# EBI SDRAM INTERFACE



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AT91RM9200-EK		A		INIT EDIT	MDZ	04/01/05	JPG	06/01/05
SDRAM & FLASH		REV		MODIF.	DES.	DATE	VER.	DATE
SCALE 1/1		REV. SHEET		63SC042261 A01		4/9		



OP2	OP1	OP0	Function
0	0	0	Dual speed 100/10 HDX
0	0	1	Reserved
0	1	0	Reserved
0	1	1	Manually select 10TX HDX
1	0	0	Manually select 10TX FDX
1	0	1	Manually select 100TX HDX
1	1	0	Manually select 100TX FDX
1	1	1	Auto negotiation enables all capabilities (default)

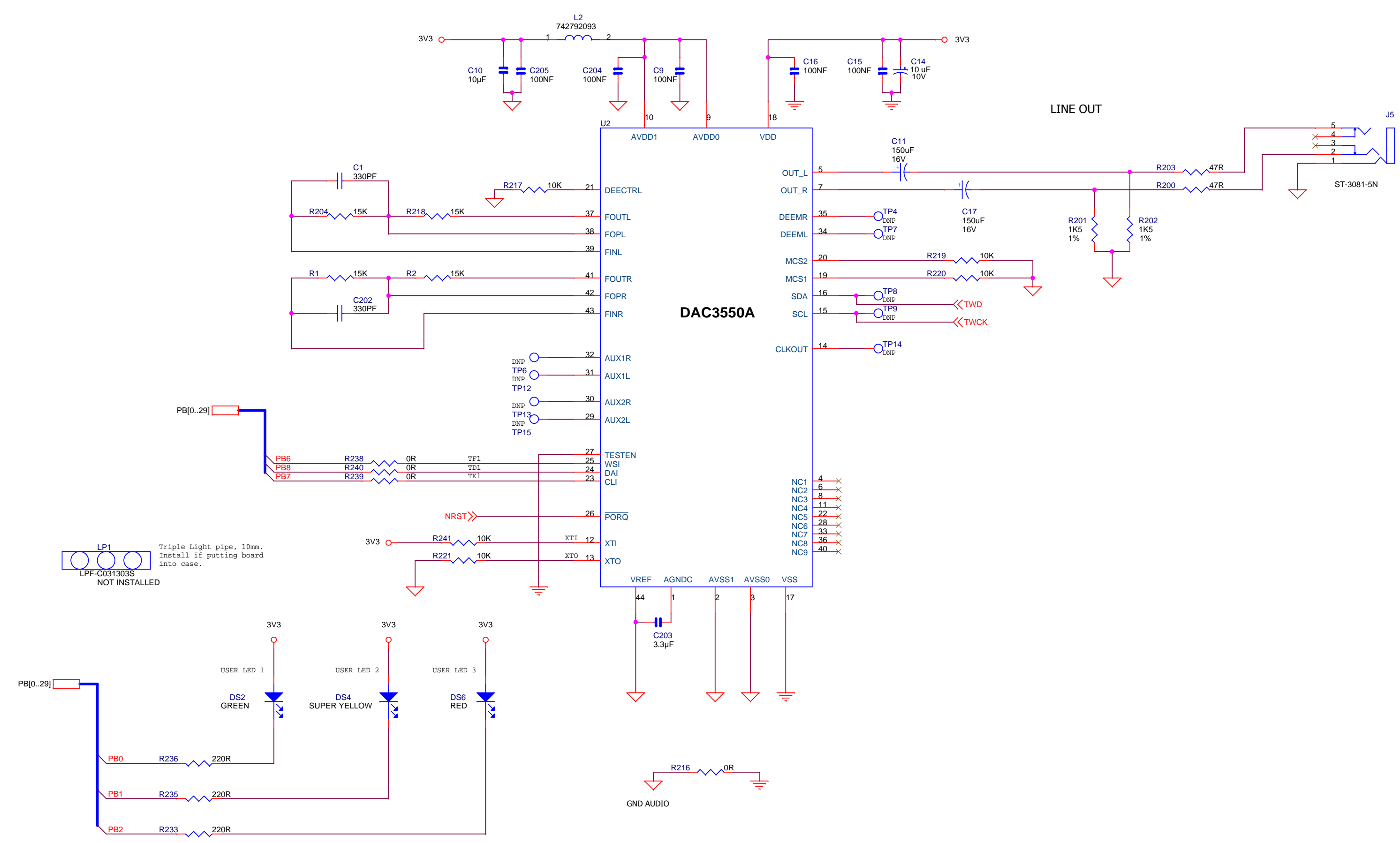
LP2 Triple Light pipe, 5mm.  
Install if putting board into case.  
LPF-C031304S NOT INSTALLED

Monday, March 21, 2005

		AT91RM9200-EK ETHERNET			
A01101-3-05-106 A INIT EDIT REV MODIF.	ELX MDZ DES.	23/02/05 04/01/05 DATE	JPG JPG VER.	23/02/05 06/01/05 DATE	
SCALE 1/1	63SC042261 A01		REV.	SHEET 5/9	

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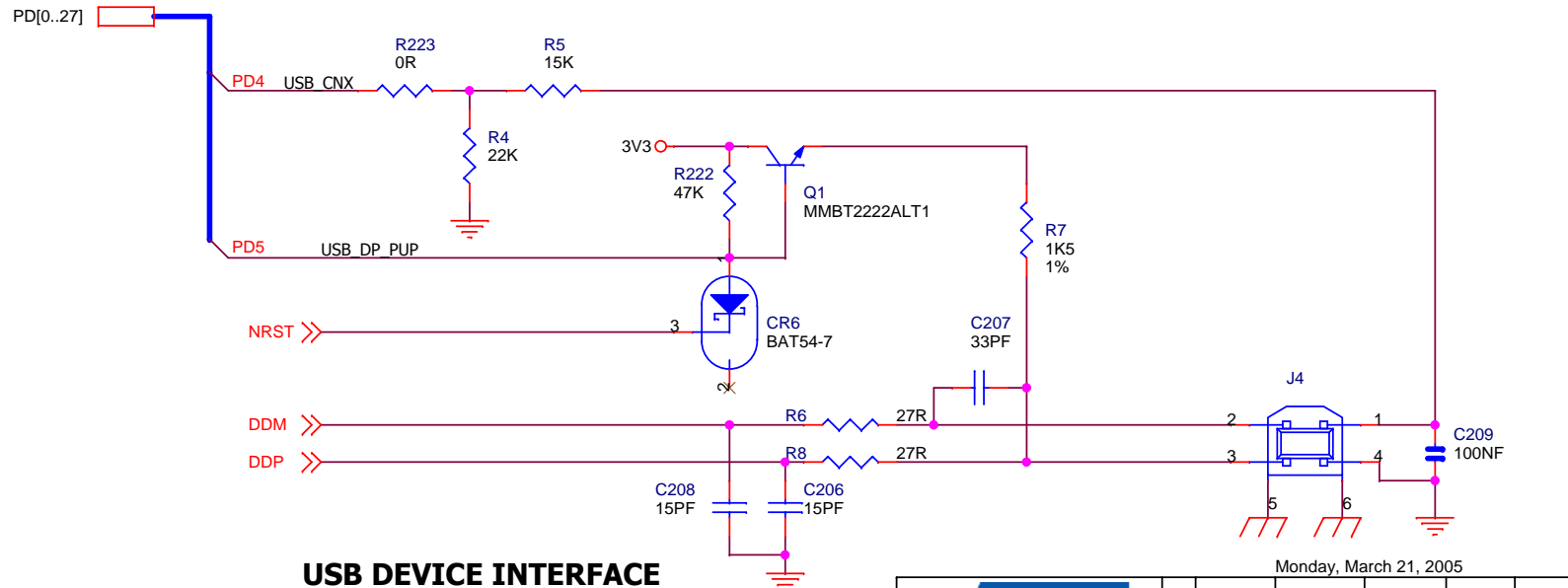
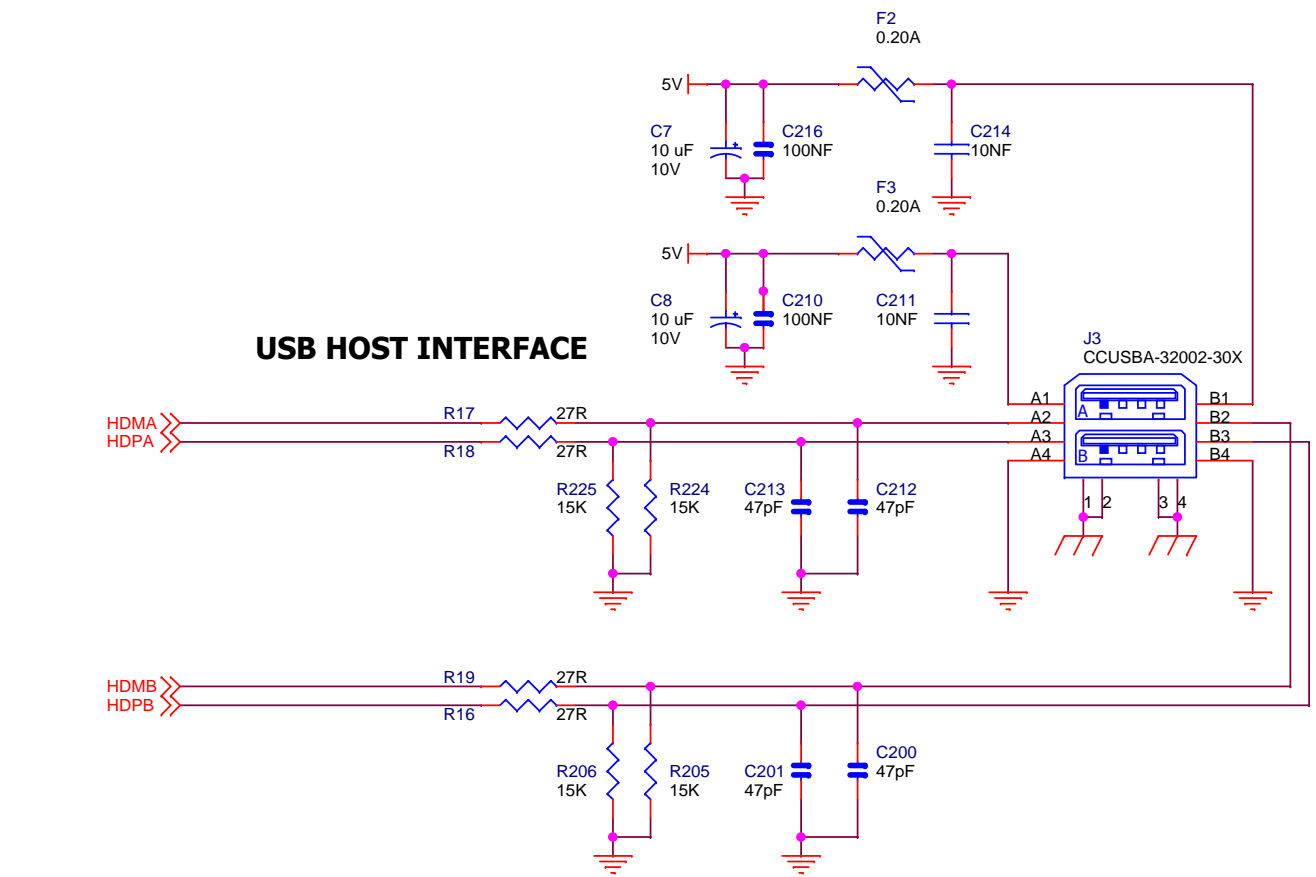
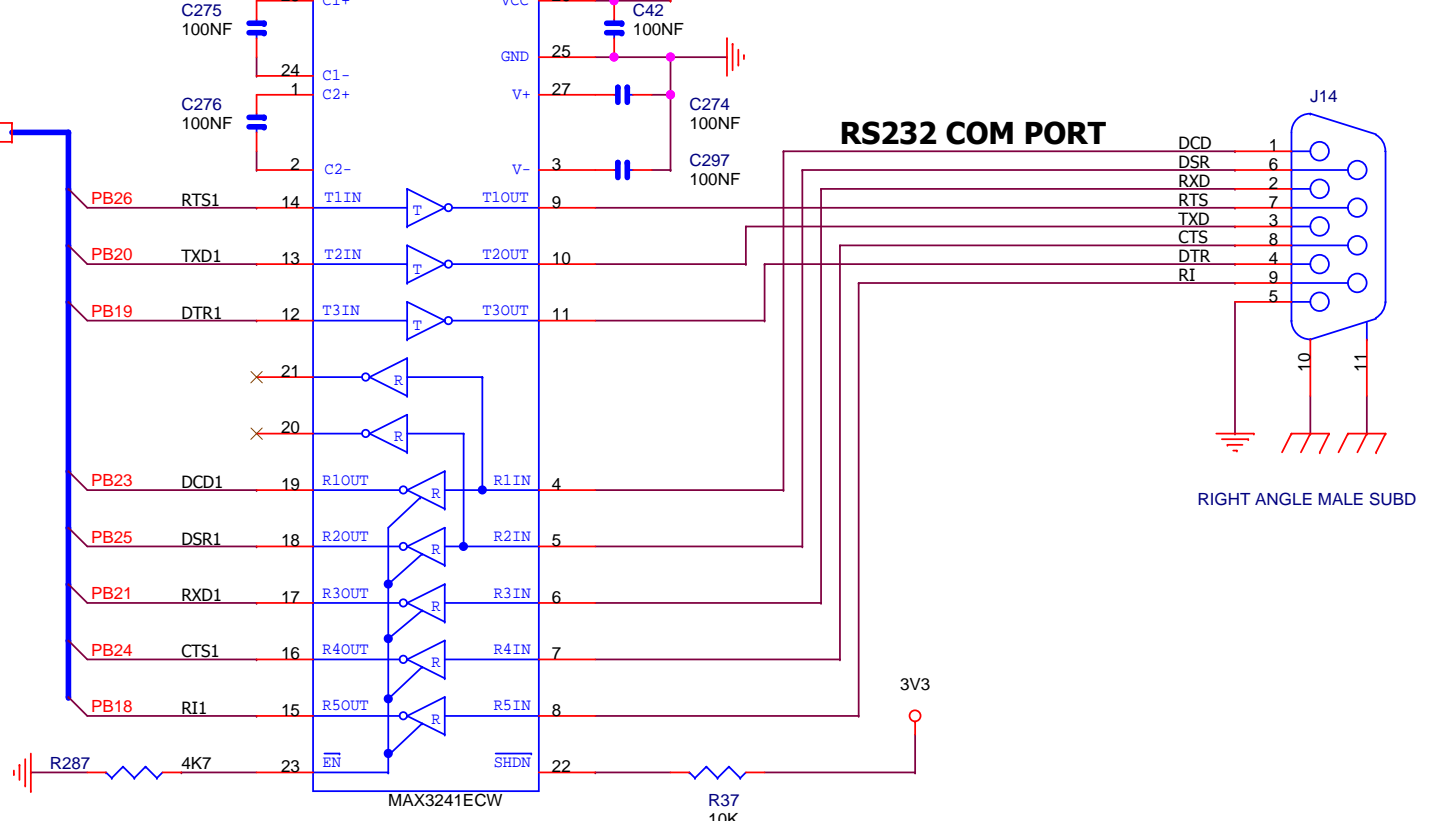
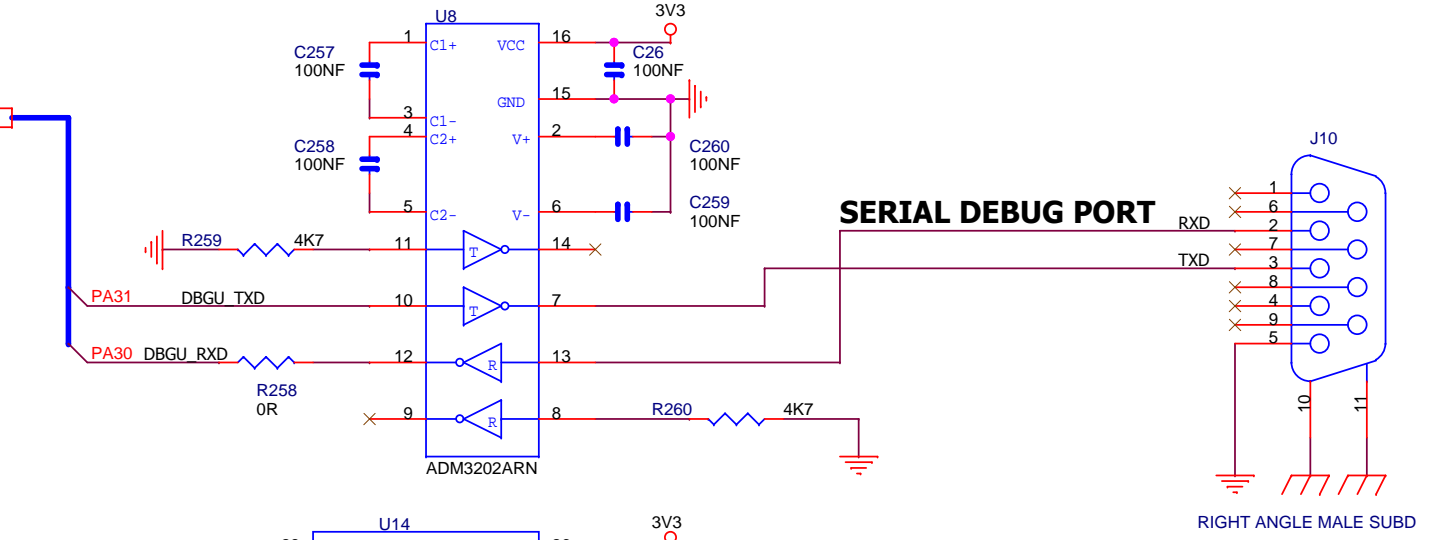
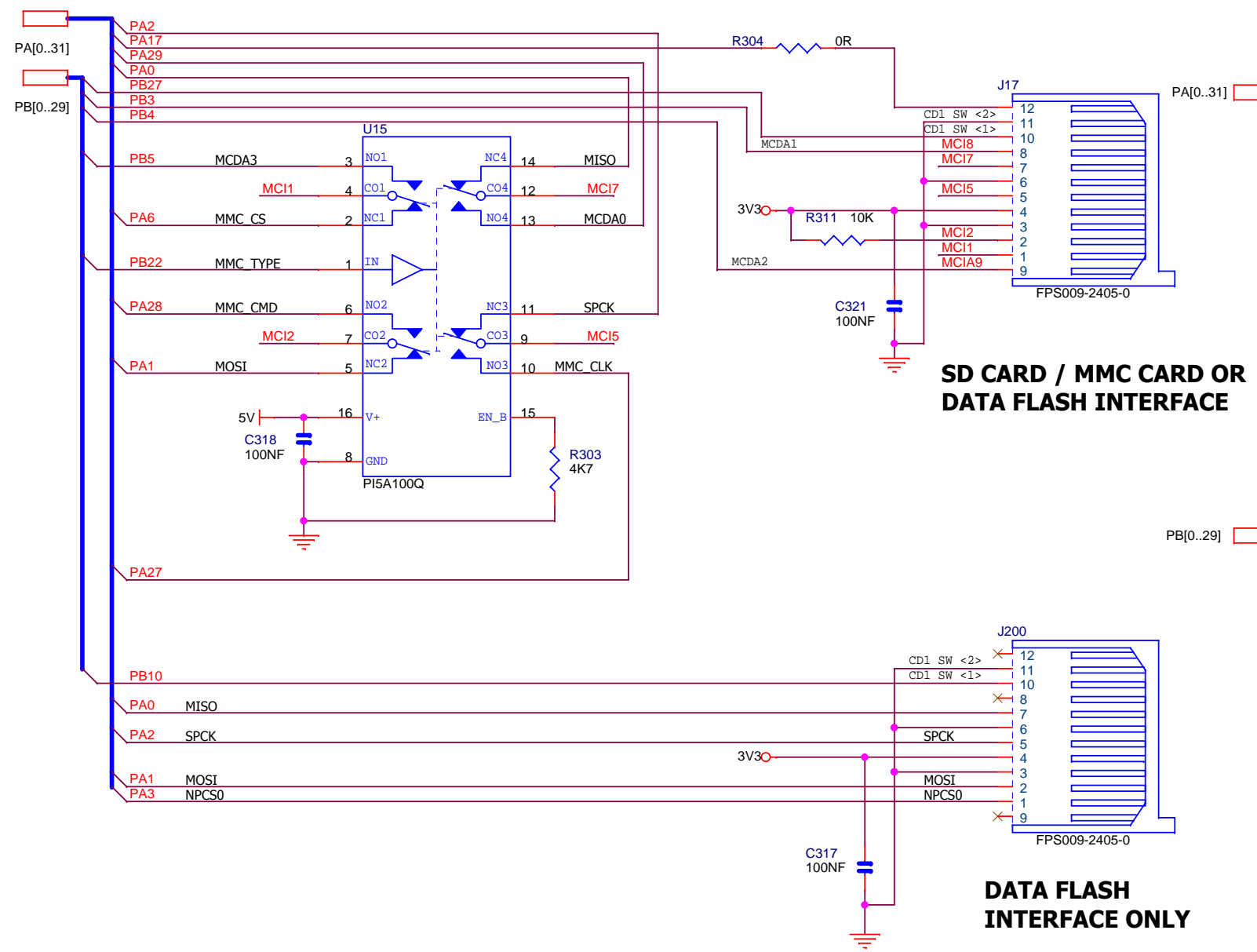


LP1 Triple Light pipe, 10mm.  
Install if putting board into case.  
LPF-C031303S  
NOT INSTALLED

Monday, March 21, 2005

		A01	101-3-05-106	ELX	23/02/05	JPG	23/02/05
AT91RM9200-EK I2S STEREO DAC		A	INIT EDIT	MDZ	04/01/05	JPG	06/01/05
SCALE 1/1 		REV	MODIF.	DES.	DATE	VER.	DATE
		63SC042261A01				REV.	SHEET 6/9

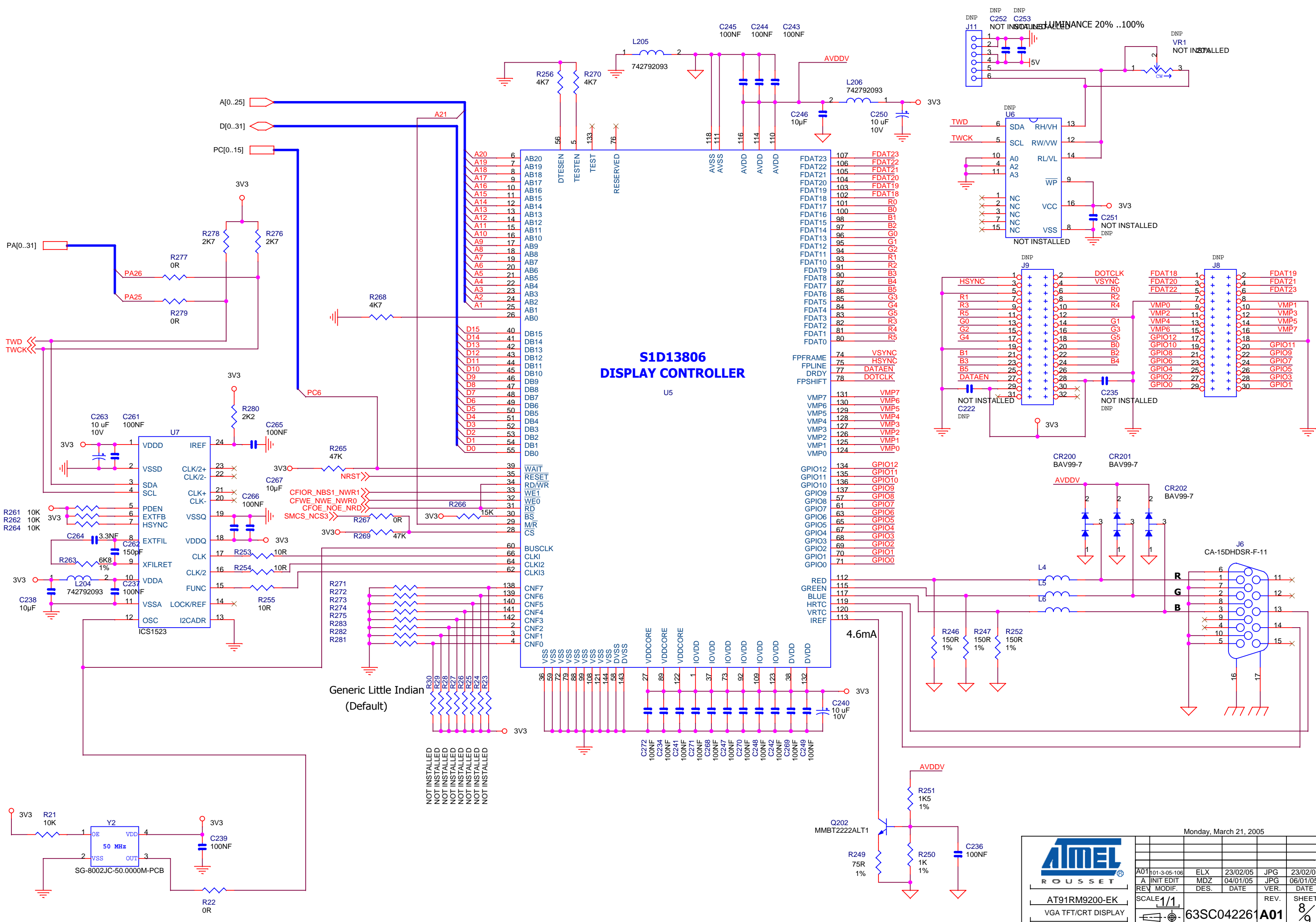
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AT91RM9200-EK		A	INIT EDIT	MDZ	04/01/05	JPG	06/01/05
SERIAL INTERFACES		REV	MODIF.	DES.	DATE	VER.	DATE
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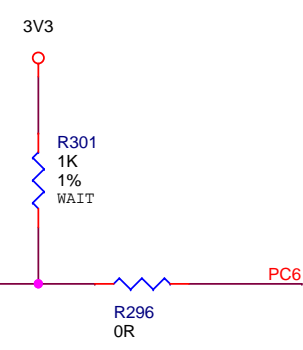
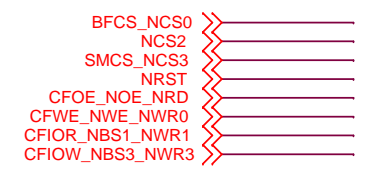
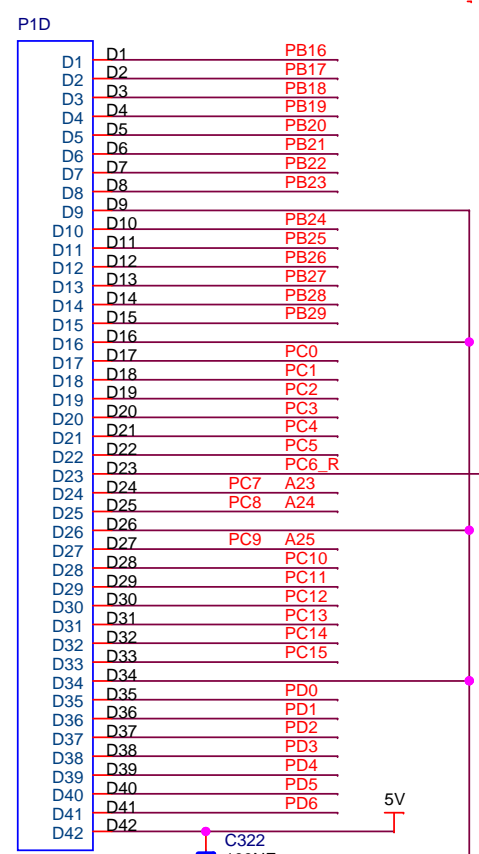
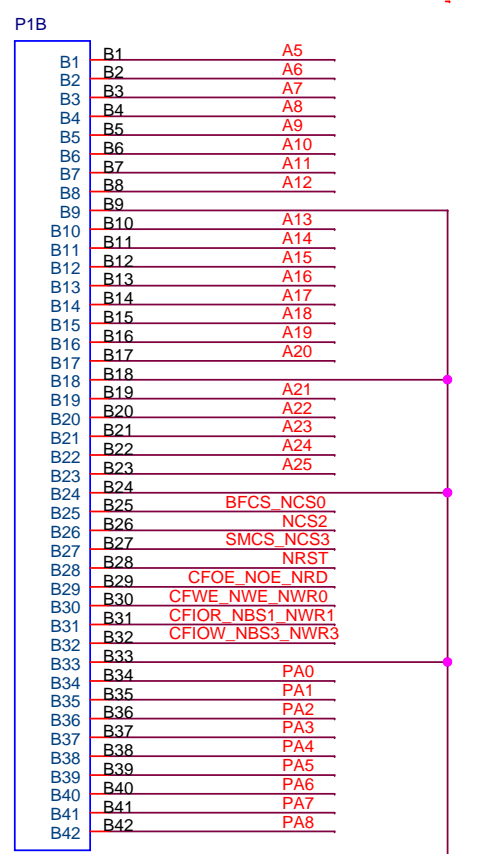
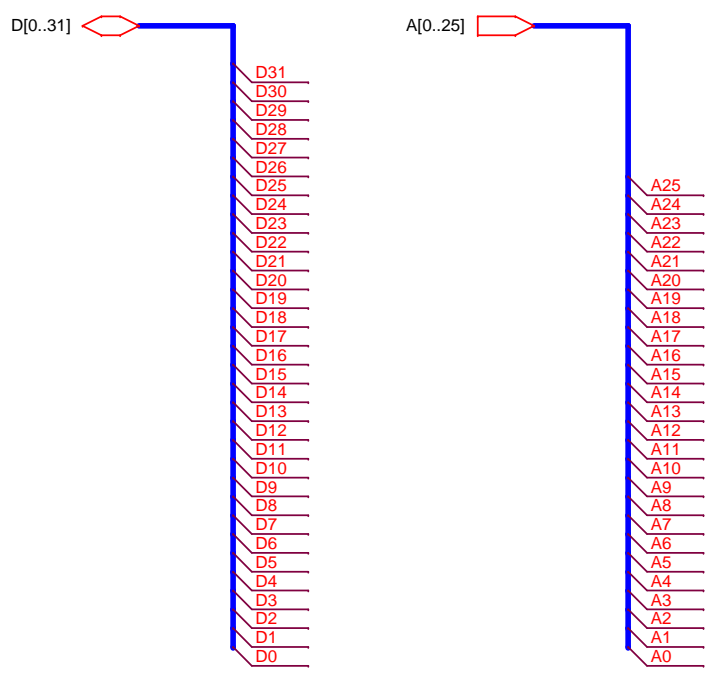
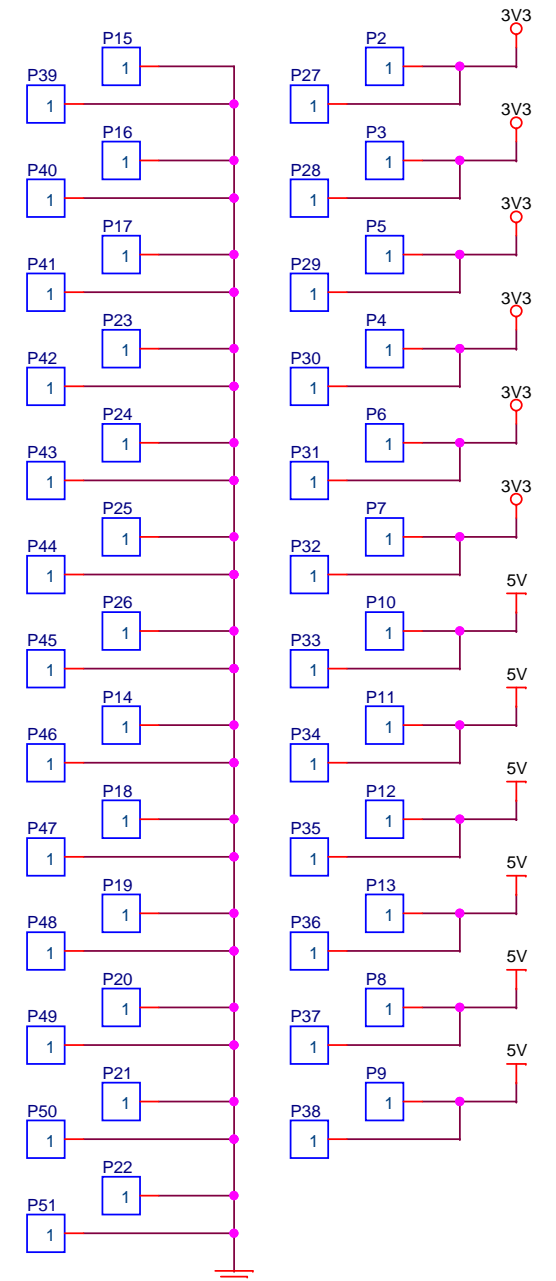
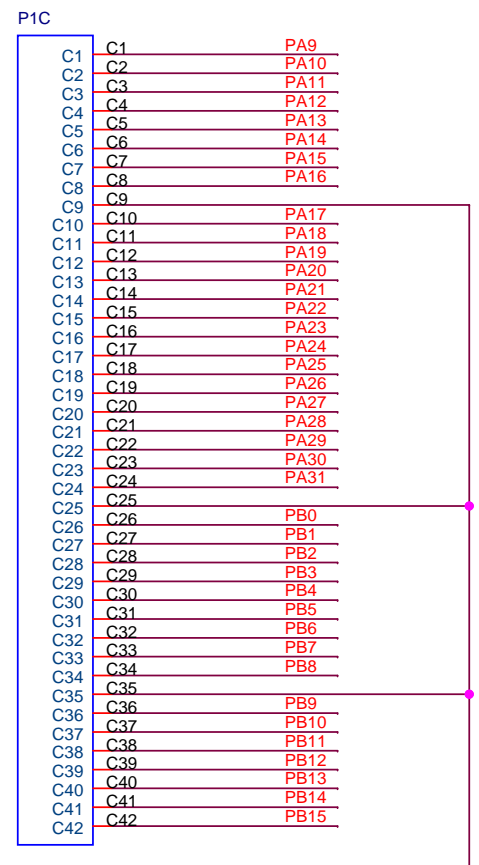
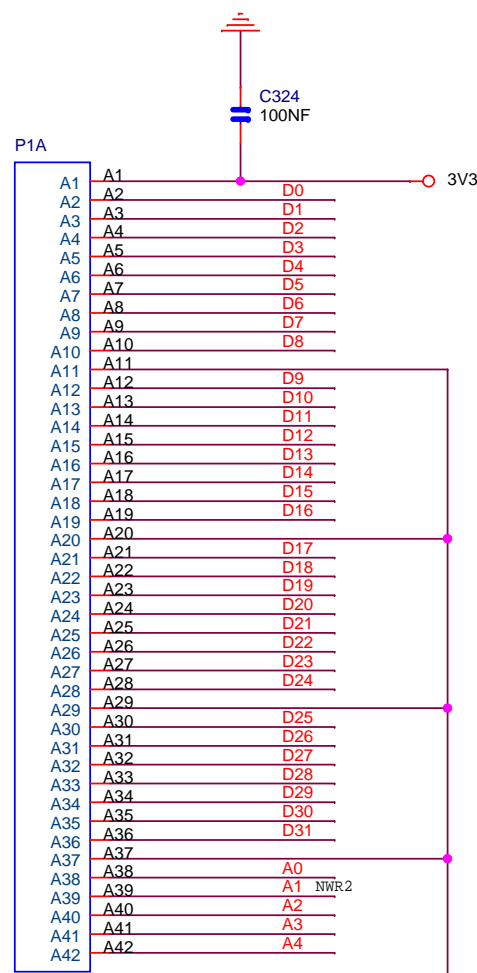
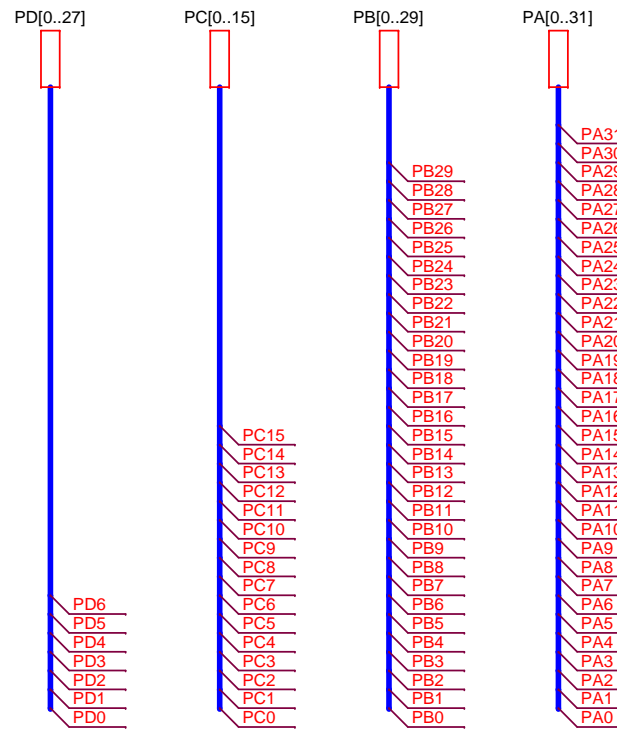


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REV	MODIF.	DES.	DATE	VER.	DATE
SCALE 1/1		63SC042261A01		REV.	SHEET 8/9

AT91RM9200-EK  
VGA TFT/CRT DISPLAY

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AT91RM9200-EK  
EXPANSION CONNECTORS

A01	101-3-05-106	ELX	23/02/05	JPG	23/02/05
A	INIT EDIT	MDZ	04/01/05	JPG	06/01/05
REV	MODIF.	DES.	DATE	VER.	DATE
SCALE 1/1		REV.		SHEET 9/9	
63SC04226			A01		

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# Section 6

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## Errata

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### 6.1 Errata

- 6.1.1 SD/MMC Card Slot Communication Problem**
- On the AT91RM9200-EK Board, revision 700-20226 REV X5, a communication problem may occur on the SD/MMC interface.
- This issue has been corrected on all boards of revision 63PC042262A by adding a 10 kOhm pull-up resistor between the pin connectors J17-2 and J17-4.



## Revision History

Doc. Rev.	Date	Comments	Change Request Ref.
6103A	24-Sep-04	First issue.	
6103B	02-Mar-05 19-Jul-05	Section 1.2, "Deliverables" on page 2; List simplified Table 4-1, Boot information modified New schematics added in Section 5.	CSR 04-361, CSR 05-028, CSR 05-246
6103C	07-Nov-05	Added Section 6, Errata.	CSR 05-478





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Fax: 1(408) 436-4314

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BP 70602  
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Fax: (33) 2-40-18-19-60

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13106 Rousset Cedex, France  
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Fax: (33) 4-42-53-60-01

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East Kilbride G75 0QR, Scotland  
Tel: (44) 1355-803-000  
Fax: (44) 1355-242-743

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74025 Heilbronn, Germany  
Tel: (49) 71-31-67-0  
Fax: (49) 71-31-67-2340

1150 East Cheyenne Mtn. Blvd.  
Colorado Springs, CO 80906, USA  
Tel: 1(719) 576-3300  
Fax: 1(719) 540-1759

### Biometrics/Imaging/Hi-Rel MPU/ High Speed Converters/RF Datacom

Avenue de Rochepleine  
BP 123  
38521 Saint-Egreve Cedex, France  
Tel: (33) 4-76-58-30-00  
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6103C-ATARM-05-Jan-06

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