

# **AT91RM9200 Development Kit**

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## **User Guide**







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# Section 1

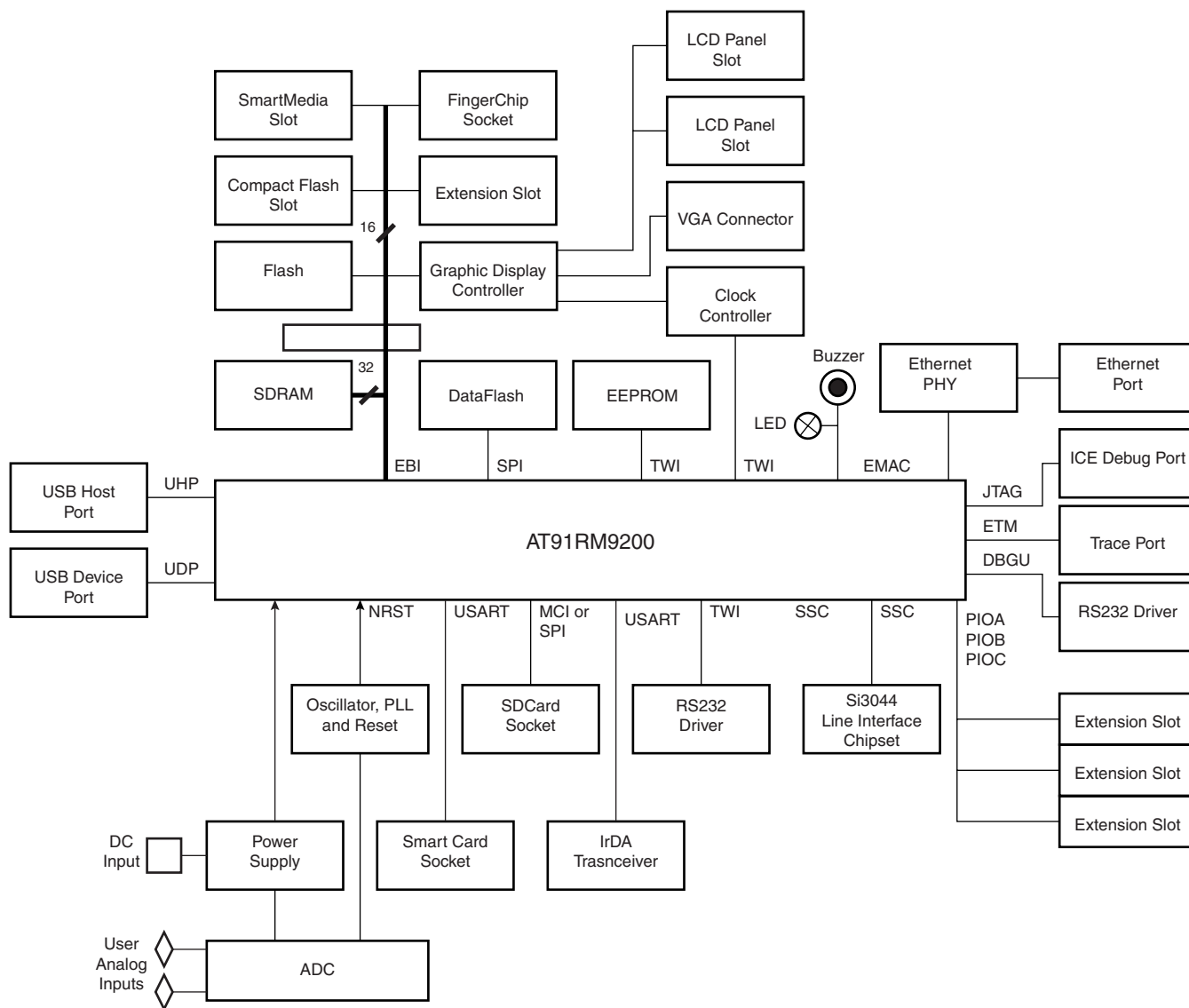
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## Overview

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|------------|-----------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>1.1</b> | <b>Scope</b>                            | <p>The AT91RM9200 Development Board enables real-time code development and evaluation. It supports the AT91RM9200 ARM9-based 32-bit RISC microcontroller.</p> <p>This guide focuses on the AT91RM9200 Development Board as an evaluation and demonstration platform:</p> <ul style="list-style-type: none"><li>■ Section 1 is this overview.</li><li>■ Section 2 gives information on setting up the installation.</li><li>■ Section 3 contains a description of the development board.</li><li>■ Section 4 details the configuration straps.</li><li>■ Section 5 shows board schematics.</li></ul>                                                                                                                             |
| <hr/>      |                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>1.2</b> | <b>Deliverables</b>                     | <p>The development kit is delivered with:</p> <ul style="list-style-type: none"><li>■ One AC adapter 100 - 240V ~ 1.0A, 50 - 60 Hz</li><li>■ One modem RS232 cable</li><li>■ One RJ45 Ethernet crossed cable</li><li>■ One A/B-type USB cable</li><li>■ Two power supply cables, one US format, one French format</li><li>■ One CD-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® Thumb® 32-bit microcontroller quickly.</li></ul> |
| <hr/>      |                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>1.3</b> | <b>The AT91RM9200 Development Board</b> | <p>The board consists of an AT91RM9200 together with the following:</p> <ul style="list-style-type: none"><li>■ 2M bytes of parallel Flash memory</li><li>■ Four banks of 2M x 32-bit SDRAM</li><li>■ 128K bytes of EEPROM with two-wire interface access</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                             |

- 8M bytes of serial DataFlash®
- Five communication ports (USB host and device, Ethernet, serial and IrDA)
- Graphic controller with output to a standard VGA monitor
- JTAG/ICE, ETM and debug interface
- Expansion connector

**Figure 1-1.** AT91RM9200 Development Board Block Diagram





## Section 2

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# Setting Up the AT91RM9200 Development Board

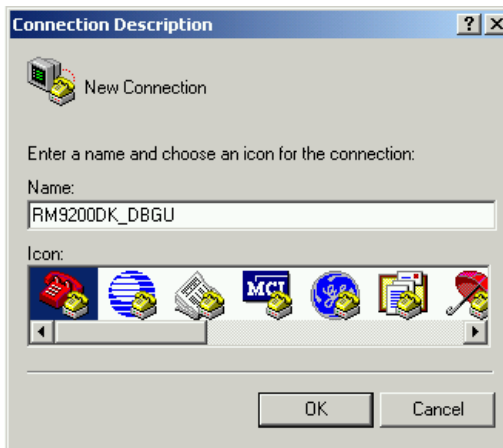
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- |            |                              |                                                                                                                                                                                                                                                                                                            |
|------------|------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>2.1</b> | <b>Electrostatic Warning</b> | The AT91RM9200 development 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. |
|------------|------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
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- |            |                     |                                                                                                                                                                                                                                                                              |
|------------|---------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>2.2</b> | <b>Requirements</b> | <p>In order to connect the AT91RM9200 development board, the following elements are required:</p> <ul style="list-style-type: none"><li>■ The AT91RM9200 development board itself</li><li>■ Power supply cable capable of supplying 7V to 12V at 1A (not supplied)</li></ul> |
|------------|---------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
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- |            |                              |                                                                                                                                                                                                                                                                                         |
|------------|------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>2.3</b> | <b>Powering Up the Board</b> | <p>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.</p> <p>The board has a voltage regulator providing +3.3V. The regulator allows the input voltage range to be from 7V to 12V.</p> |
|------------|------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## 2.4 Connecting the Board

- Using the RS232 cable supplied in the AT91RM9200-DK kit, connect the board to your PC via the Serial Debug Port (J23).

- Start the HyperTerminal application:  HyperTerminal

- In the window *Connection Description*, enter a name for the connection, e.g., "RM9200K\_DBGU".

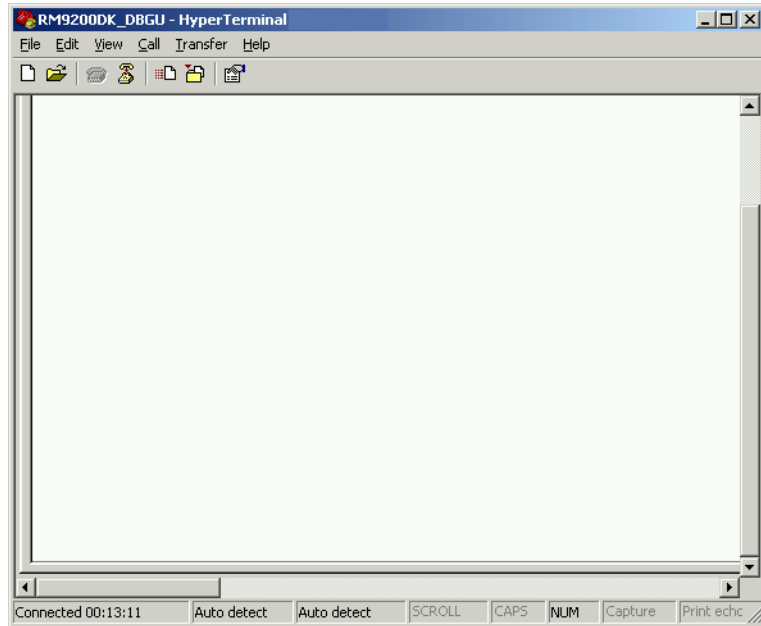


- Click on *OK*.
- In the window *Connect To*, click on the drop-down list arrow at *Connect using:*. Select the COM port used.

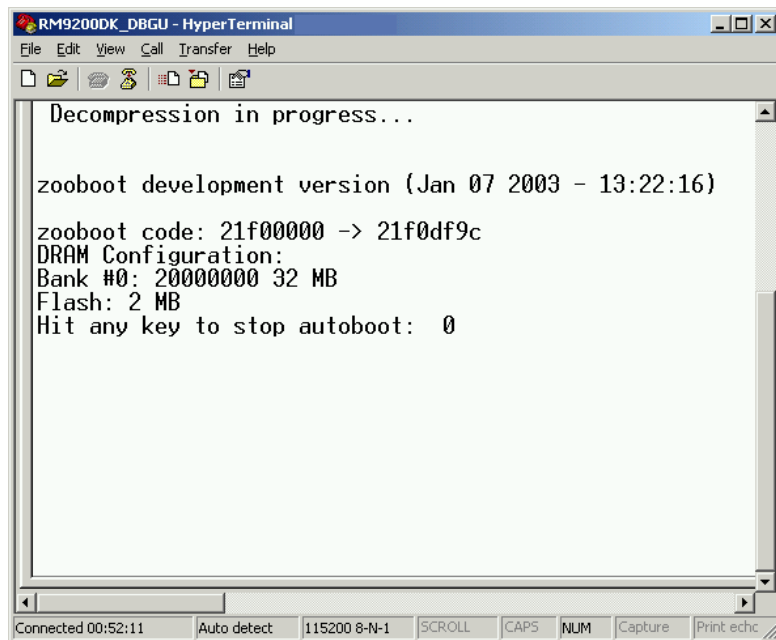


- Click on *OK*.
- Set the serial parameters of the COM port as follows:
  - Bit rate: 115 kbps
  - Data bit: 8
  - Parity: NONE
  - Stop bit: 1
  - Flux control: NONE
- Click on *OK*.

- The AT91RM9200-DK and your PC are connected, as indicated in the lower left-hand corner of the console and by the title bar.



- Press the RESET button on the board.
- A message is sent from the board to the HyperTerminal console. Note that this message can vary depending on the version of Zooboot.



## 2.5 Getting Started with the AT91RM9200

The AT91RM9200 Development Kit is delivered with a CD-ROM containing all necessary information and step-by-step procedures for working with the most common development toolchains. Please refer to this CD-ROM, or to the AT91 web site, <http://www.atmel.com/products/AT91/>, 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 Data Controller (DMA)
  - 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

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### 3.2 Memory

- 2-Mbyte parallel Flash memory
- Four banks of 2M x 32-bit SDRAM
- 128-Kbyte EEPROM with 2-wire interface
- 8-Mbyte serial DataFlash

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### 3.3 Memory Card

- SD Card/MMC
  - Supports MultiMedia and SD Card
  - Analog switches provide support for DataFlash Card
- Smart Media® Socket
- CompactFlash® Socket
- Smart Card Interface

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### 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
- Temperature sensor
- Analog-to-digital converter
- FingerChip (Socket only)

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### 3.5 Reset Circuitry

- Reset Controller

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### 3.6 Power Supply Circuitry

- 3.3V DC/DC converter
- 1.8V DC/DC converter

- 
- |            |                             |                                                                                                                                                                                                                                                                                                   |
|------------|-----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>3.7</b> | <b>Remote Communication</b> | <ul style="list-style-type: none"><li>■ Fast Ethernet Physical Layer Single Chip Transceiver</li><li>■ IrDA Transceiver</li><li>■ Host Interface via RS-232 DB9 male socket</li><li>■ Line interface</li><li>■ Debug Port via RS-232 DB9 connector</li><li>■ Host and Device USB socket</li></ul> |
|------------|-----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
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- |            |                       |                                                                                                                                                                                                                                              |
|------------|-----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>3.8</b> | <b>User Interface</b> | <ul style="list-style-type: none"><li>■ Graphic Display Controller</li><li>■ TFT/SNT panel socket</li><li>■ 15-pin standard socket for an external VGA monitor</li><li>■ On-board buzzer and one LED managed via general PIO lines</li></ul> |
|------------|-----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
- 
- |            |                        |                                                                                                                          |
|------------|------------------------|--------------------------------------------------------------------------------------------------------------------------|
| <b>3.9</b> | <b>Expansion Slots</b> | <ul style="list-style-type: none"><li>■ Three expansion slots give access to all the microcontroller's signals</li></ul> |
|------------|------------------------|--------------------------------------------------------------------------------------------------------------------------|
- 
- |             |                        |                                                                                                                                                  |
|-------------|------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>3.10</b> | <b>Debug Interface</b> | <ul style="list-style-type: none"><li>■ 38-pin trace Port socket</li><li>■ 20-pin JTAG interface connector</li><li>■ Serial Debug Unit</li></ul> |
|-------------|------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|
-





## 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 development board and their default settings.

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

| Designation | Default Setting | Feature                                                                                                        |
|-------------|-----------------|----------------------------------------------------------------------------------------------------------------|
| S1          | Closed          | The earth plane and the GDN potential are connected.                                                           |
| S3          | Closed          | The ETM reset (NSRST) and the System Reset (NRST) are connected.                                               |
| S4          | Closed          | The <b>PD6/DTXD</b> PIO line is connected to the <b>READY/NBUSY</b> output signal of the SPI DataFlash (MN13). |
| S5          | Opened          | The Write Protect feature of the SPI DataFlash (MN13) is disabled.                                             |
| S6          | Closed          | The PA26/ <b>TWCK</b> /IRQ1 signal is connected to three remote devices (MN14, MN33, MN34).                    |
| S7          | Closed          | The PA25/ <b>TWD</b> /IRQ2 signal is connected to three remote devices (MN14, MN33, MN34).                     |
| S8          | Opened          | The PA3/ <b>NPCS0</b> /IRQ5 output signal is not connected to the <b>NCS</b> of the serial DataFlash (MN13).   |
| S9          | Closed          | The PA5/ <b>NPCS2</b> /TXD3 signal is connected to the 10-bit SPI ADC (MN15).                                  |
| S10         | Closed          | The PC15 I/O line is connected to the 10-bit ADC to read the End Of Conversion event (MN15).                   |
| S11         | Closed          | Not Used: The PS2 Controller is not installed.                                                                 |
| S12         | Closed          | Not Used: The PS2 Controller is not installed.                                                                 |
| S13         | Closed          | The PB12/ <b>TF2</b> /ETX2 signal is connected to the NRGDT/FSD output signal of the Line Interface (MN23).    |
| S14         | Closed          | The PB16/ <b>RK2</b> /ERX2 signal is connected to the NOFHK input signal of the Line Interface (MN23).         |
| S15         | Closed          | The PB17/ <b>RF2</b> /ERXDV signal is connected to the NFSYN input signal of the Line Interface (MN23).        |

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

| Designation | Default Setting | Feature                                                                                                                                  |
|-------------|-----------------|------------------------------------------------------------------------------------------------------------------------------------------|
| S16         | Closed          | The PB13/ <b>TK2</b> /ETX3 signal is connected to the SCLK output signal of the Line Interface (MN23).                                   |
| S17         | Closed          | The PB15/ <b>RD2</b> /ERX2 signal is connected to the SDO output signal of the Line Interface (MN23).                                    |
| S18         | Closed          | Not Used: The Front End AC97 is not installed.                                                                                           |
| S19         | Closed          | The PA30/ <b>DRXD</b> /CTS2 signal is connected to the receive buffer output of the DBGU transceiver (MN26).                             |
| S20         | Closed          | The AT91RM9200's PC14 PIO line is connected to the NREADY output signal of the Smart Card Interface (MN29).                              |
| S21         | Closed          | The PA17/TXD0/TIOA0 is connected to the DATA input/output signal of the Smart Card Interface (MN29).                                     |
| S22         | Closed          | The PA22/ <b>RXD2</b> /TIOB2 is connected to the RX output signal of the IrDA Transceiver (MN30).                                        |
| S23         | Closed          | Enables all output signals (DCD1, DSR1, RXD1, CTS1, RI1) of the Transceiver (MN28) used for the RS232 Port COM.                          |
| S24         | Closed          | The <b>PD4</b> /ETXEN input line is connected to the USB device socket (J28) to detect a host connection.                                |
| S25         | Closed          | The System Reset signal (NRST) is connected to the ICE/JTAG socket (J8, pin 15).                                                         |
| S26         | Closed          | The NCS2 output signal is connected to the display controller (MN32).                                                                    |
| S27         | Closed          | The NCS0 output signal is connected to the parallel Flash memory (MN21).                                                                 |
| S28         | Closed          | Enables the OE signal from the Atmel FingerChip (MN31). Only the socket is installed.                                                    |
| S29         | Closed          | The <b>SMCS</b> /NCS3 output signal is connected to the bidirectional buffer used by the Smart Media Connector (MN20B).                  |
| S30         | Closed          | The PA15/ <b>EMDC</b> /TCLK2 output signal is connected to the <b>MDC</b> input signal of the Ethernet Transceiver (MN22).               |
| S31         | Closed          | The PA16/ <b>EMDIO</b> /IRQ6 input/output signal is connected to the <b>MDIO</b> input/output signal of the Ethernet Transceiver (MN22). |
| S32         | Closed          | Disables the power-down mode of the Ethernet Transceiver (MN22).                                                                         |
| S33         | Closed          | Not Used: The Front End AC97 is not installed.                                                                                           |
| S34         | Closed          | Not Used: The Front End AC97 is not installed.                                                                                           |
| S35         | Closed          | Not Used: The Front End AC97 is not installed.                                                                                           |
| S36         | Closed          | Connects the system ground to the Ethernet ground.                                                                                       |
| S37         | Closed          | Not Used: The Front End AC97 is not installed.                                                                                           |

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

| Designation | Default Setting | Feature                                                 |
|-------------|-----------------|---------------------------------------------------------|
| S38         | Opened          | The AT91RM9200 boots up from the parallel Flash Memory. |
| S39         | Closed          | Enables the use of the User LED (DS5).                  |
| S40         | Closed          | Not Used: The Buzzer is not installed.                  |

**Note:** Shaded cells indicate configuration straps/jumpers with open connections.

**Note:** Signal names in bold indicate that the function is shared between several signals.





## Section 5

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# Schematics

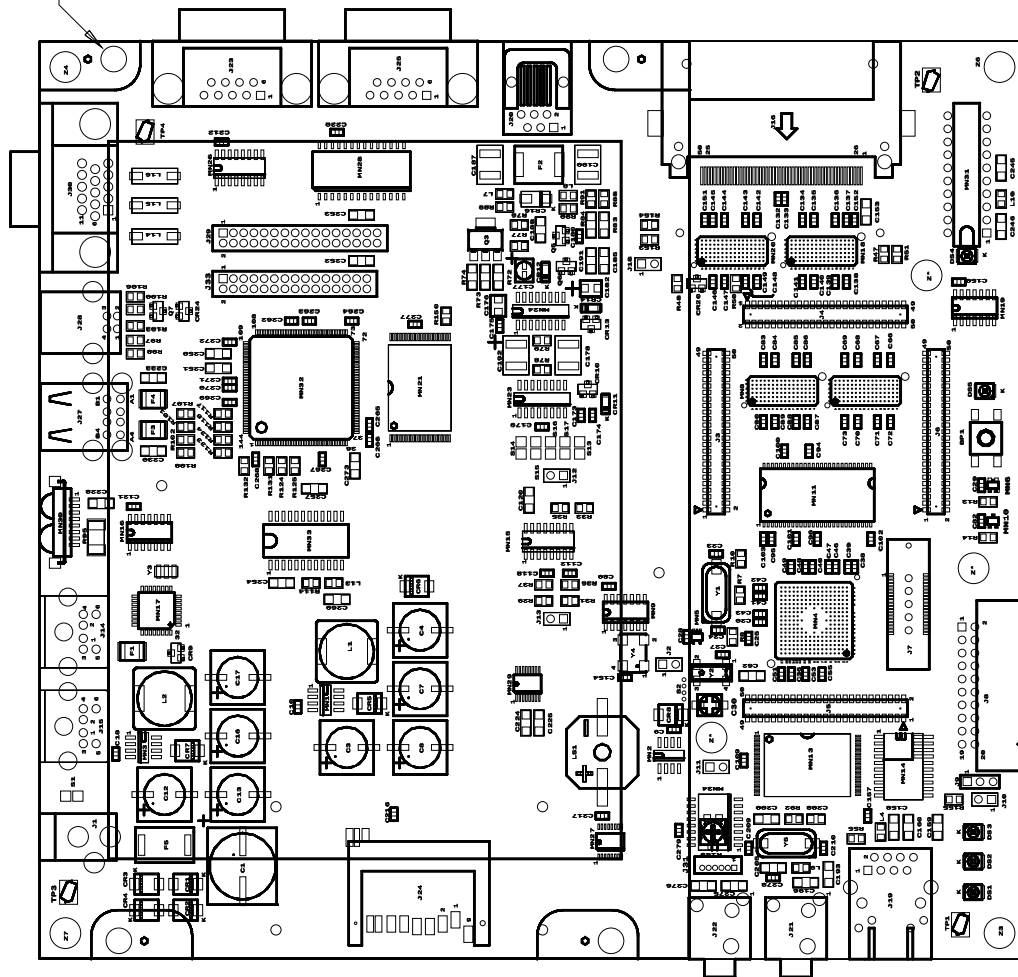
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### 5.1 Schematics

This section contains the following schematics:

- AT91RM9200 Board Layout - Top View
- AT91RM9200 Board Layout - Bottom View
- Power Supply
- AT91RM9200 Chip
- Buffers
- SDRAM and Flash
- Serial Devices
- PS2 COM Ports
- 3V3 Memory Card
- Ethernet
- DAA
- AC97 Analog Front End
- Serial Interfaces
- Fingerchip
- VGA TFT/CRT Display

# VUE FACE ELEMENTS



MONTAGE DU LCD  
SUR SUPPORT 63PC021039 VOIR DETAIL

2 VIS CM 2,5X8 INOX A2  
2 RONDELLES ONDULEX DIA.2,5  
2 ECROUS HM2,5 INOX A2

4 ENTRETOISES R/F HEXA  
M2,5X10 INOX A2

LCD

SUPPORT 63PC021039

MODULE

4 ENTRETOISES R/F HEXA  
M2,5X25 INOX A2

CI 63PC02512

8 VIS CM 2,5X10 INOX A2  
8 RONDELLES ONDULEX DIA.2,5

FILS SORTIES CONNECTEURS A FRETTER

NOTA : COMPOSANTS A MONTER SELON NOMENCLATURE

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TEL 04 92 02 45 45 FAX 04 92 02 45 46

ATMEL

CARTE AT91RM9200-DK

PLAN D'EQUIPEMENT

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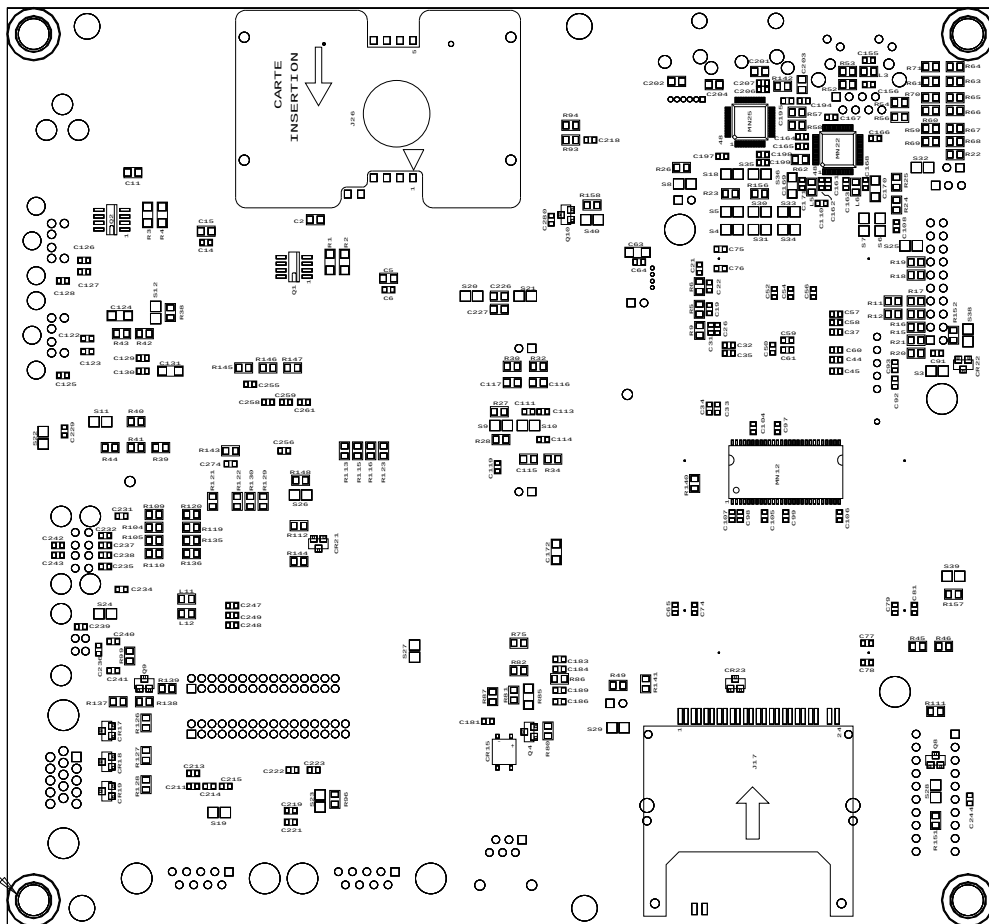
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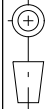
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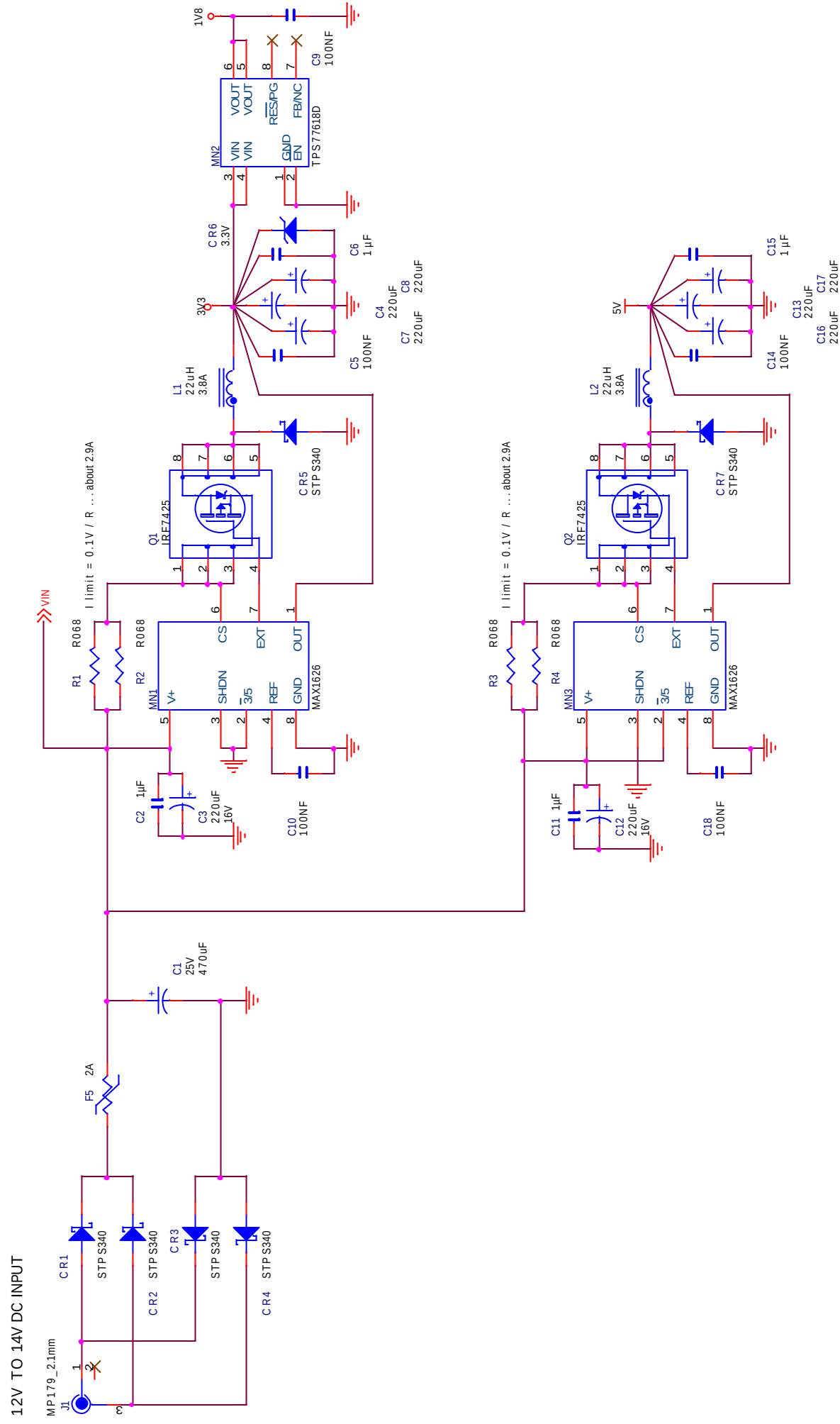
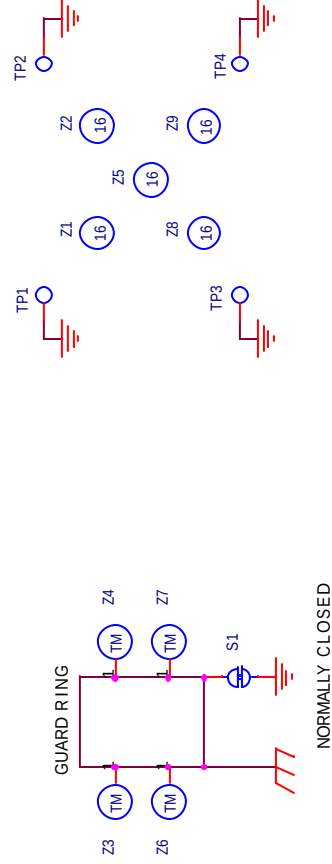
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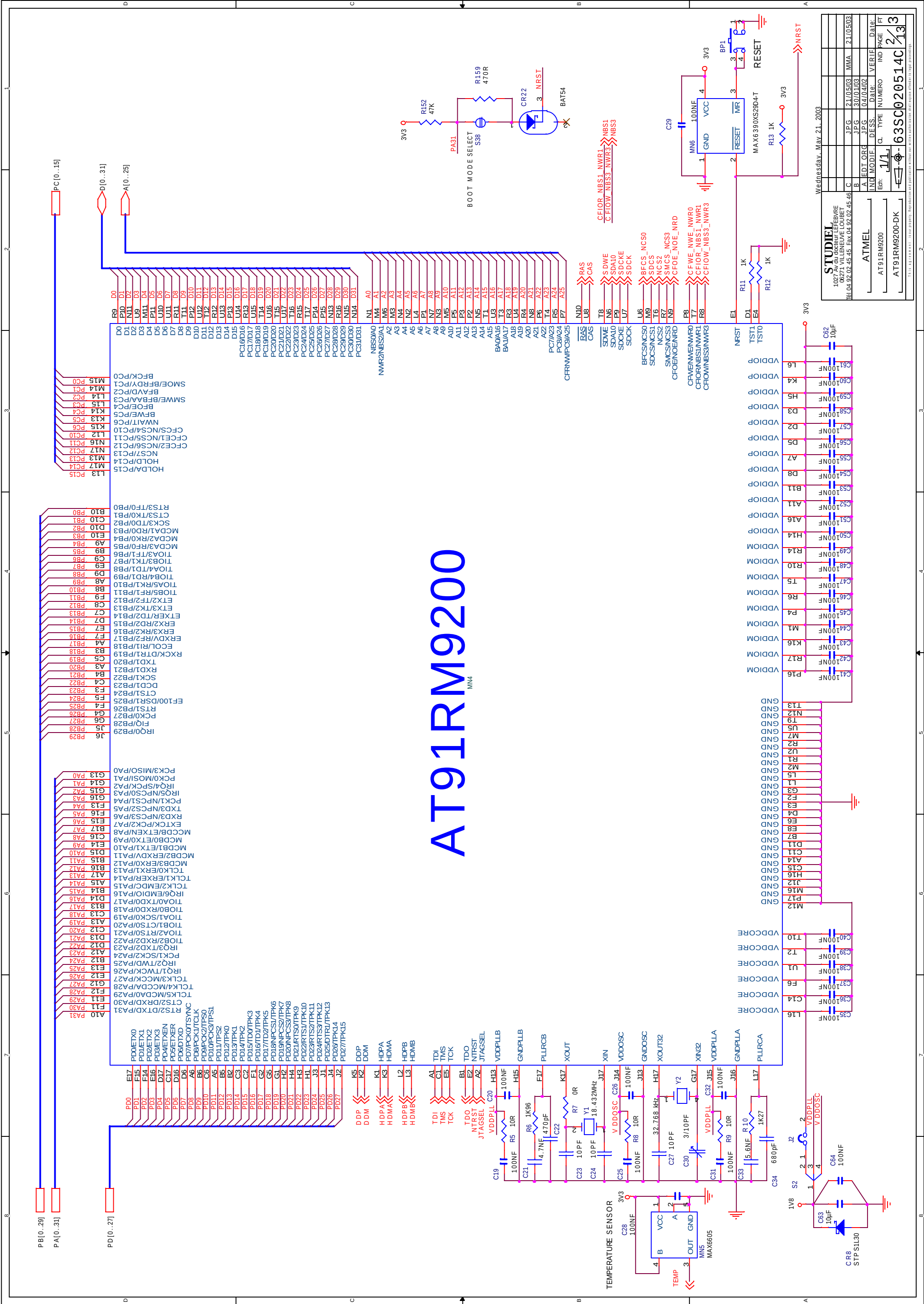
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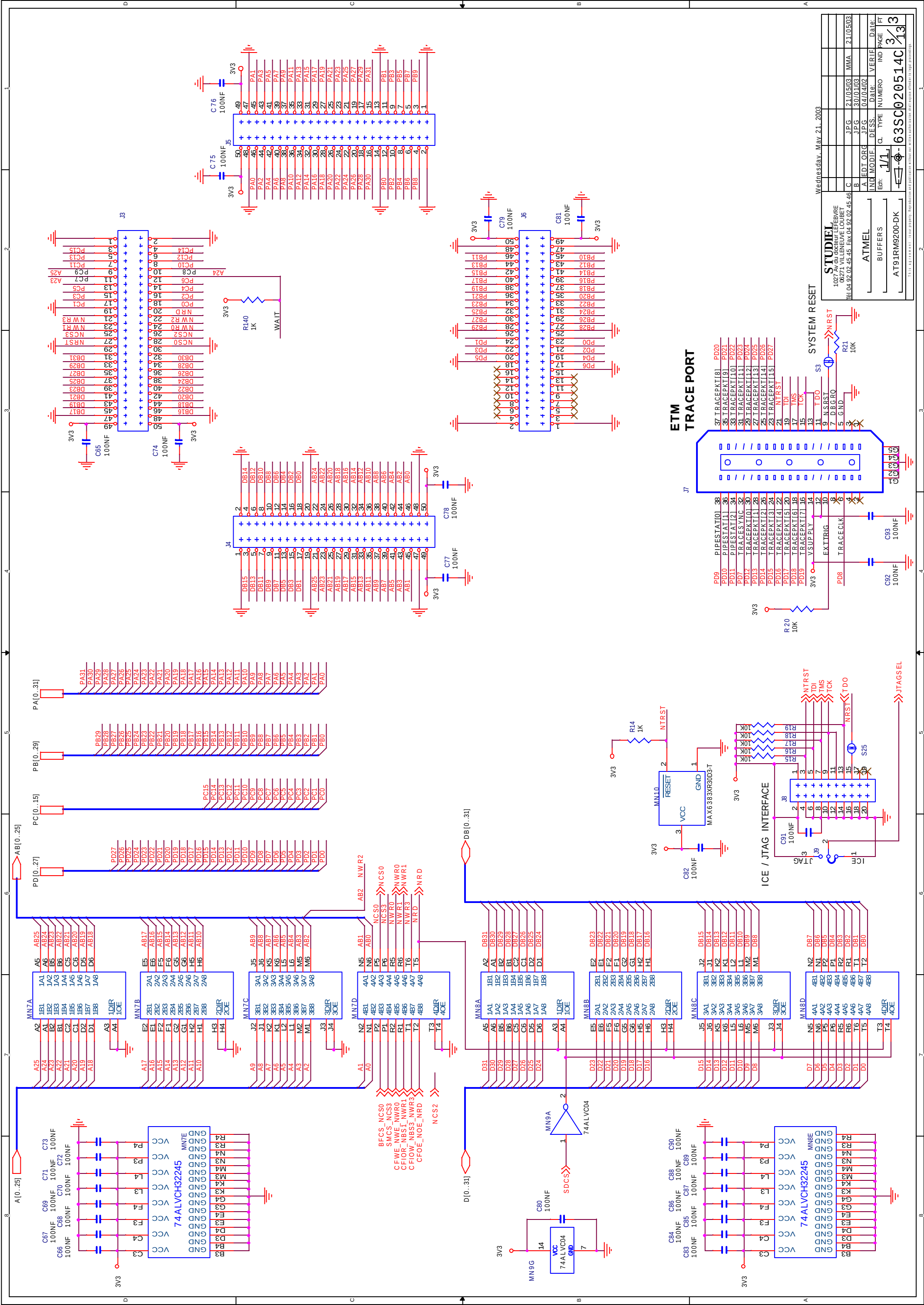
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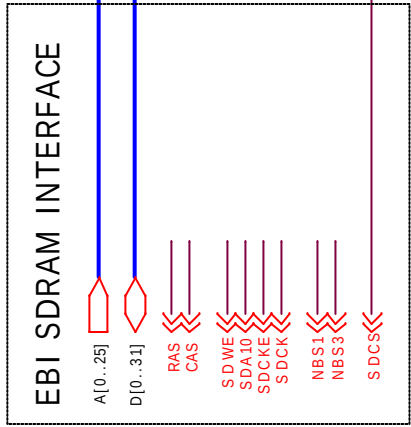
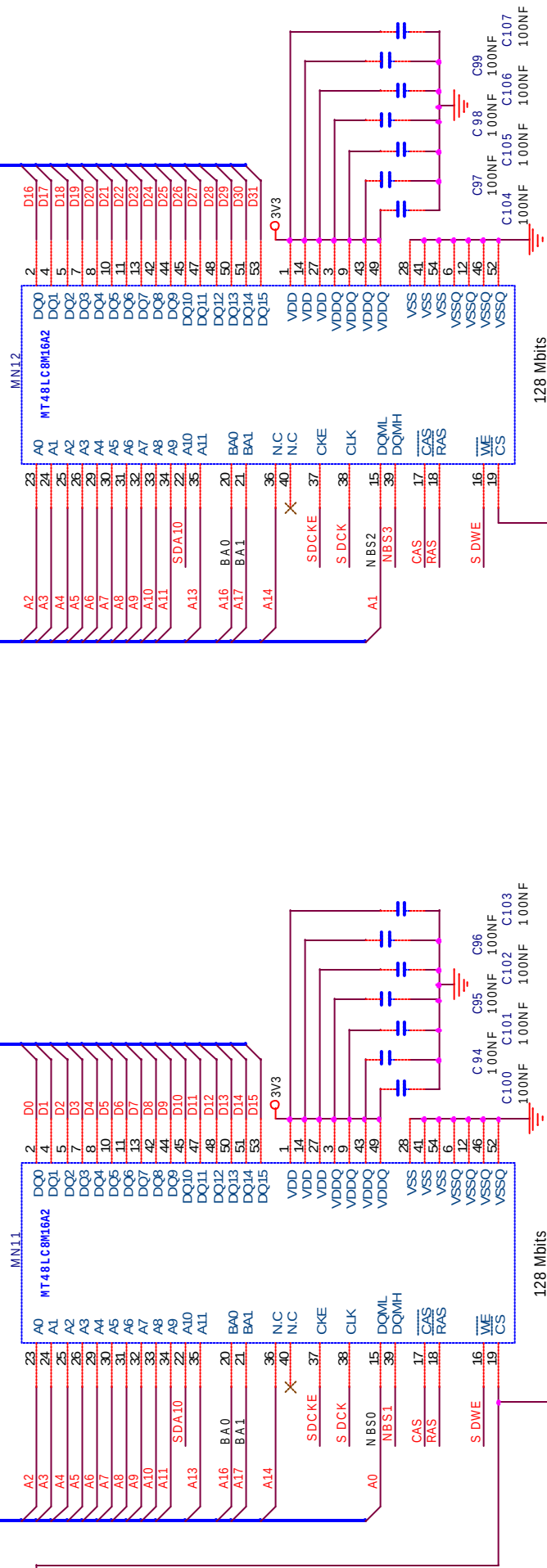
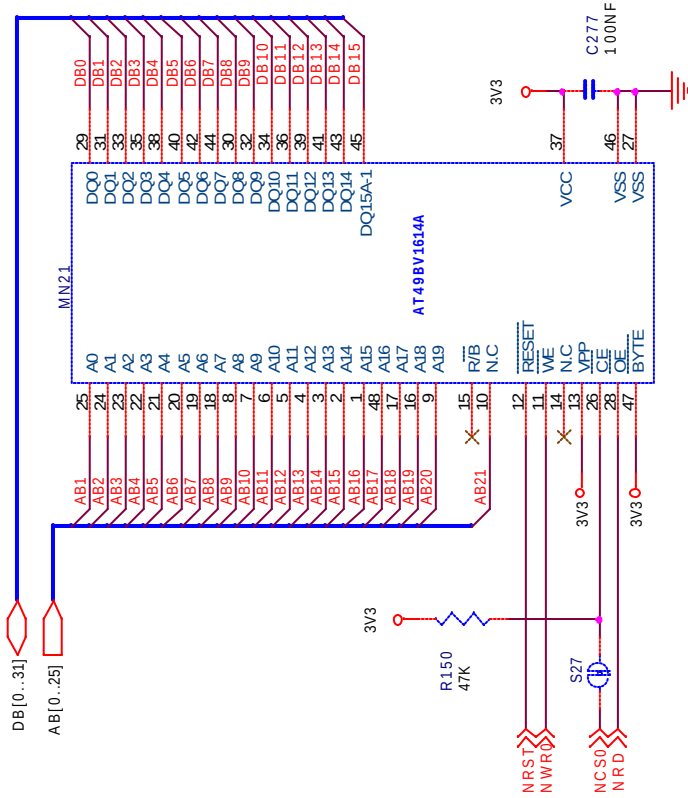


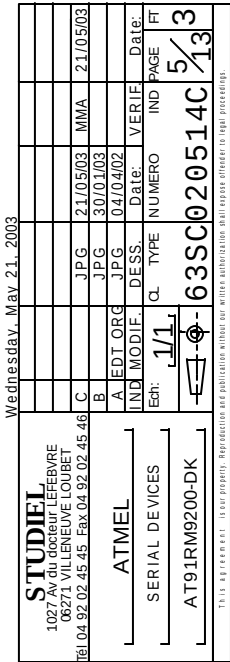


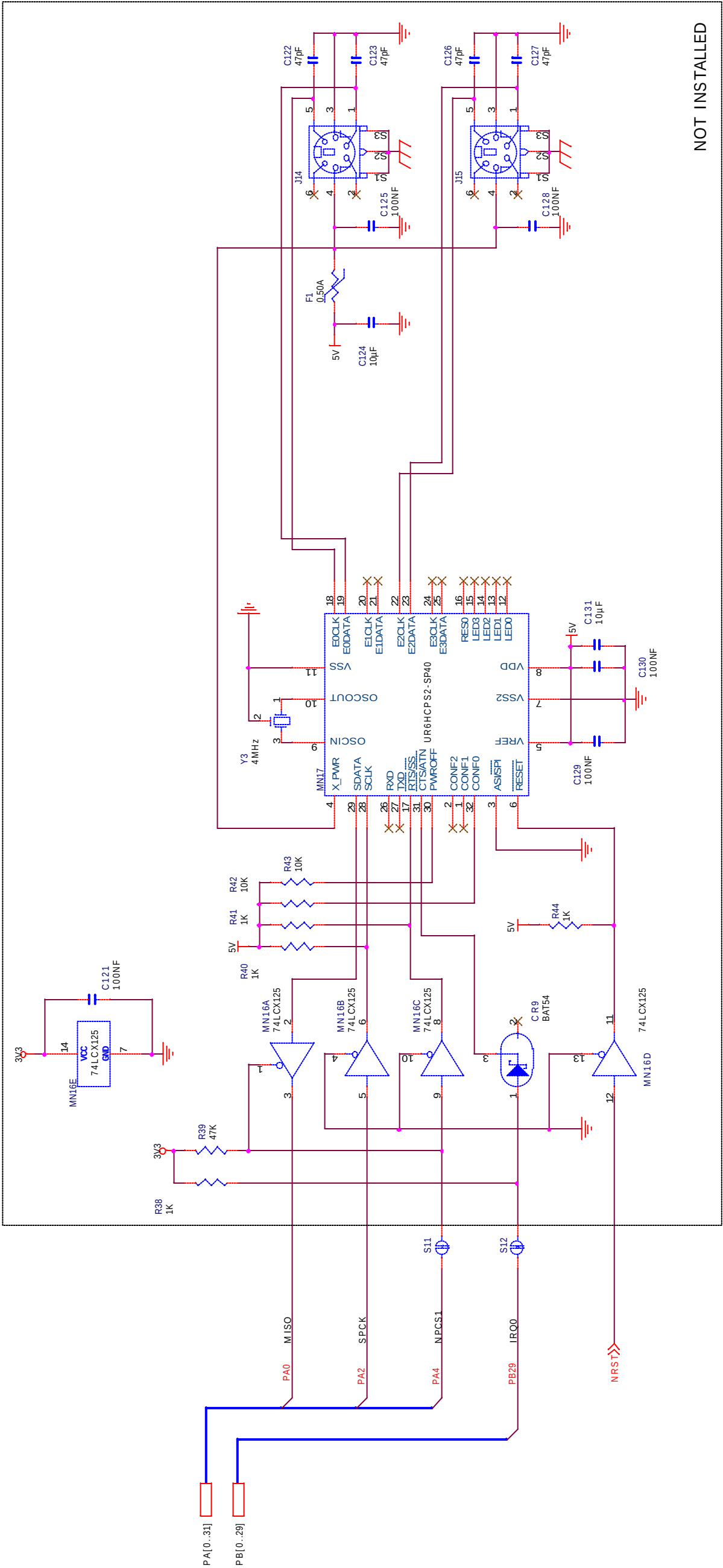
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|--------|--|---------------------------------------------------------------------------------------------------|--|------|--|----------|--|----------|--|----------|--|-------------|--|
| STUDEL |  | 1027 AV DU DOCTEUR LEFEBVRE<br>06271 VILLENEUVE LOUBET<br>TEL 04 92 02 45 45 - FAX 04 92 02 45 46 |  | C    |  | JPG      |  | 21/05/03 |  | MMA      |  | 21/05/03    |  |
|        |  |                                                                                                   |  | B    |  | JPG      |  | 30/01/03 |  |          |  |             |  |
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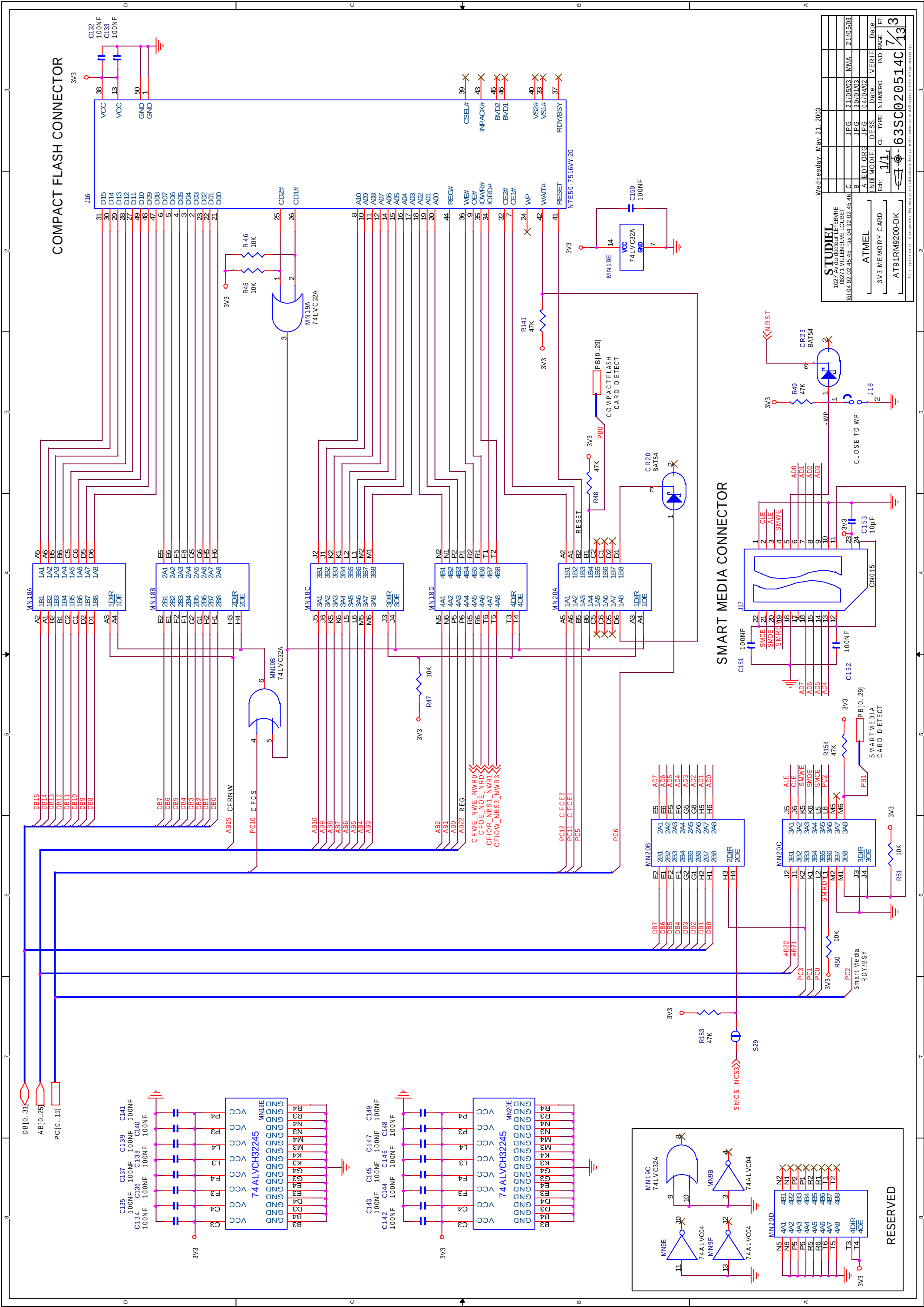
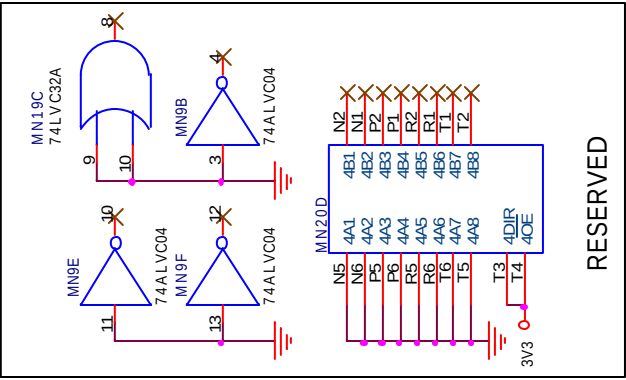
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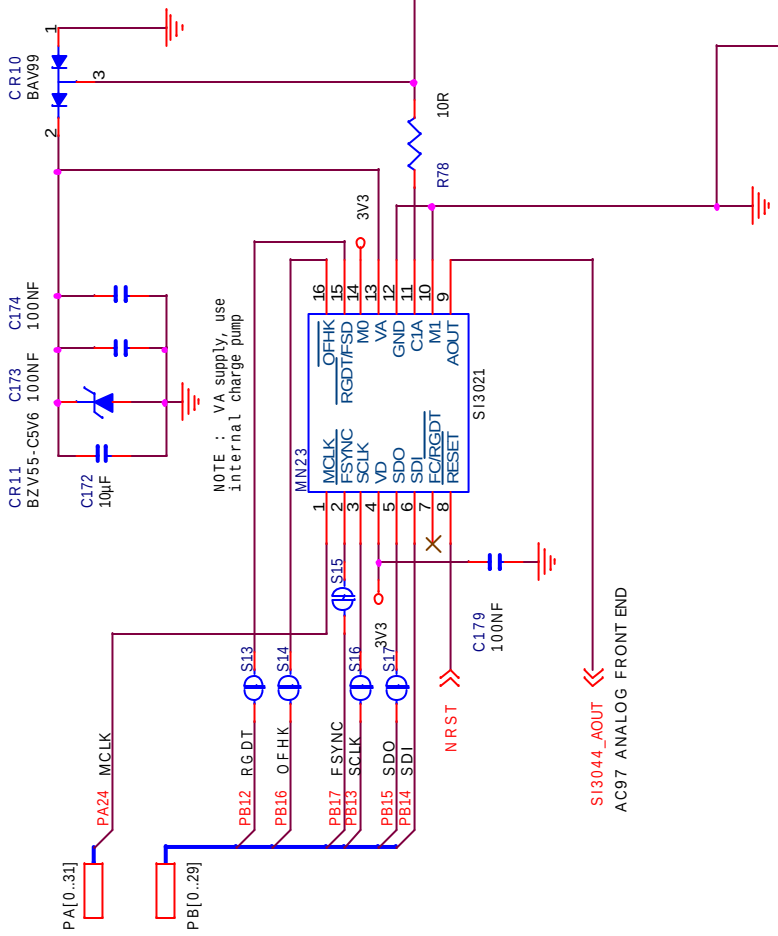


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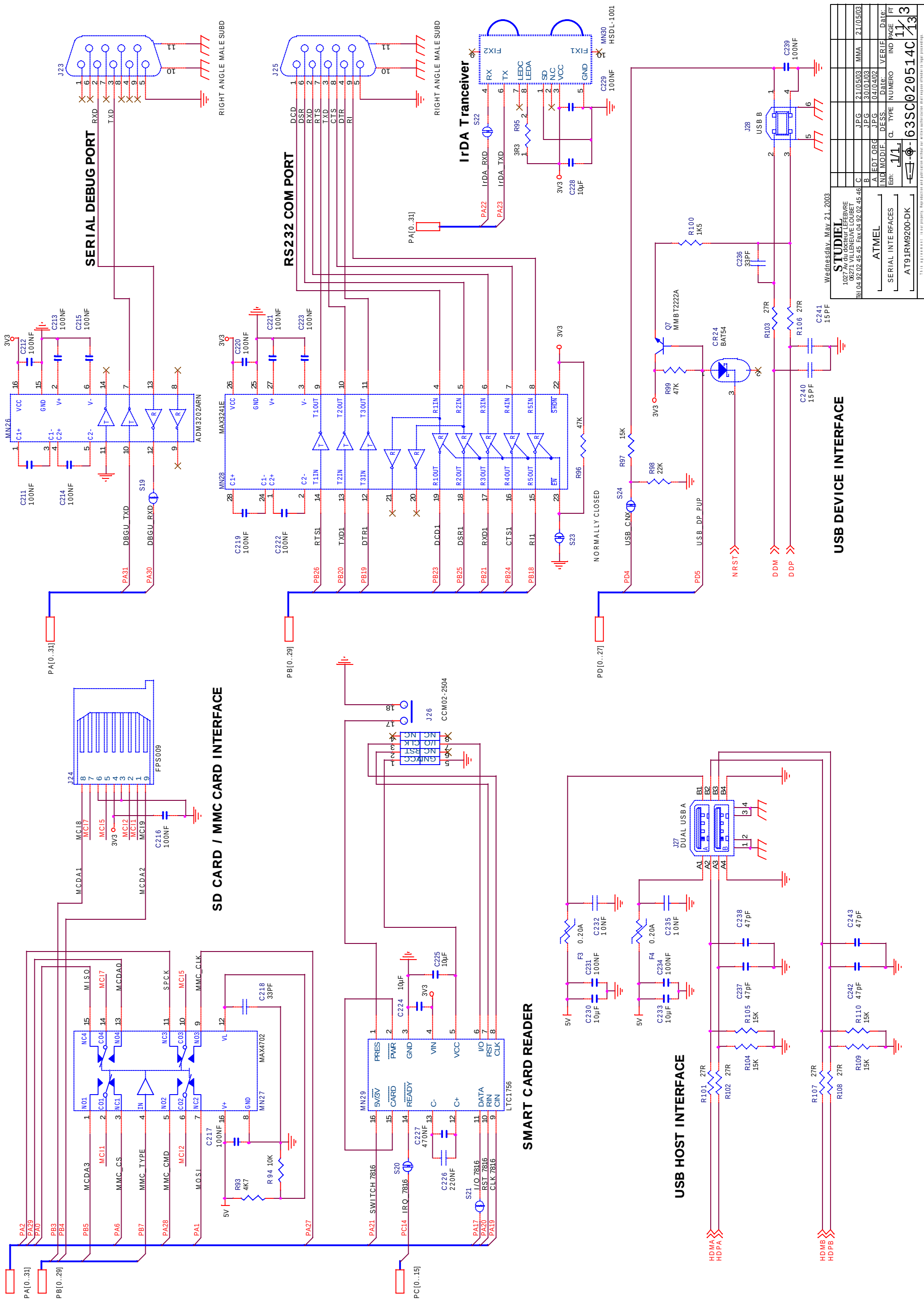


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| STUDEL                                                                                                                                |         | Wednesday, May 21, 2003 |             |
| 10274 av du coureur LEREBGE                                                                                                           |         |                         |             |
| CAVILLON 57100 REBER                                                                                                                  |         |                         |             |
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| C                                                                                                                                     | 3PG     | 21/05/03                | MMA         |
| B                                                                                                                                     | 3PG     | 30/01/03                |             |
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| ATMEL                                                                                                                                 |         |                         |             |
| 3V3 MEMORY CARD                                                                                                                       |         |                         |             |
| AT91RM9200-DK                                                                                                                         |         |                         |             |
|                                                    |         | 63SC020514C             |             |
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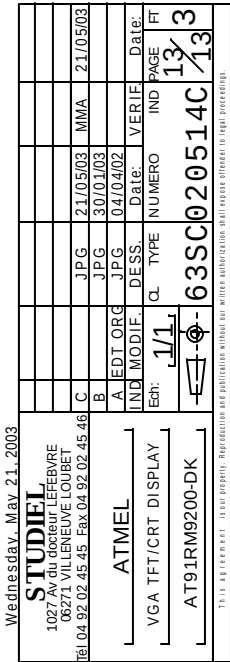














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