

# **AT91RM9200 Development Kit**

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## **User Guide**







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# Section 1

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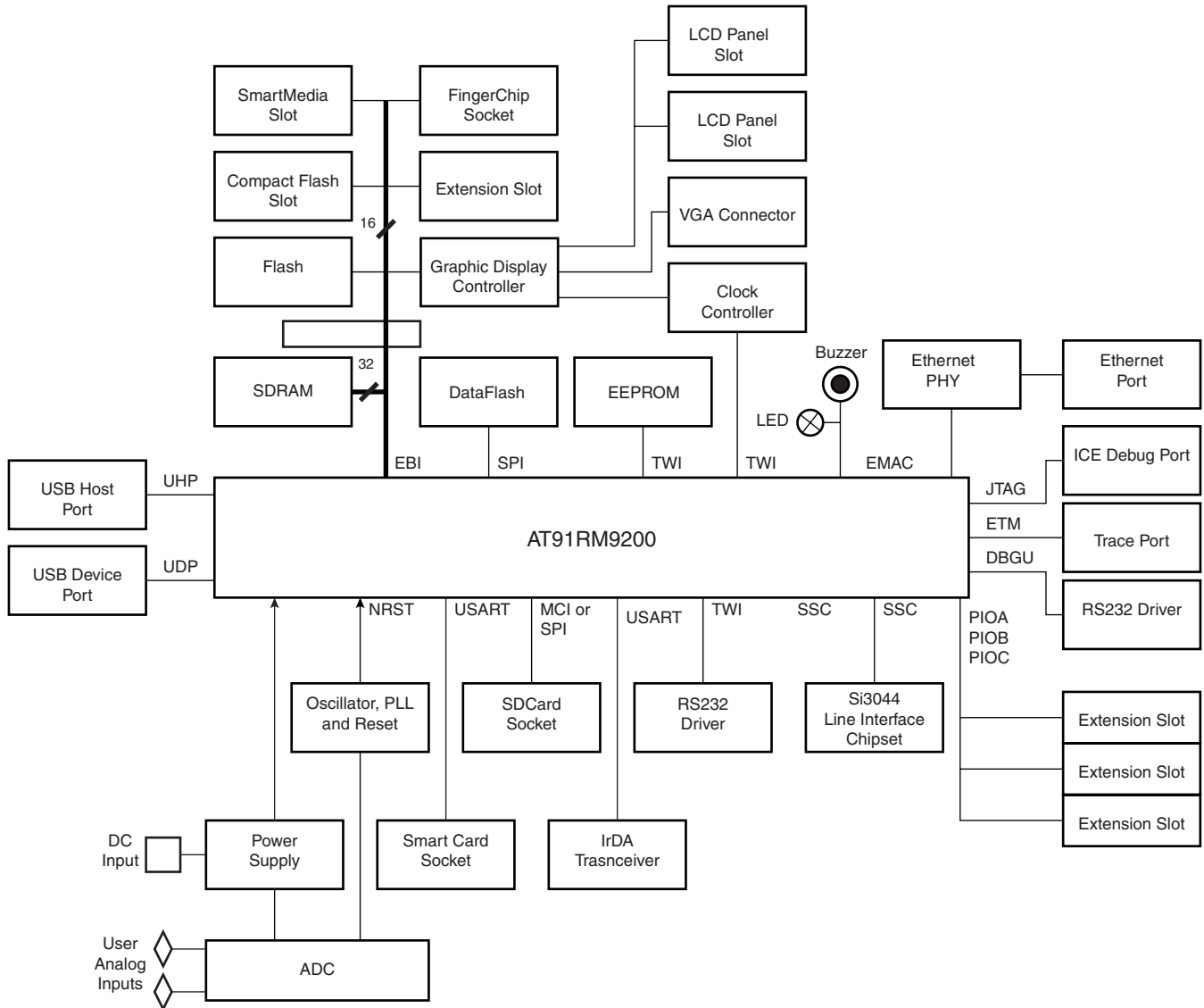
## Overview

- 
- 1.1 Scope** The AT91RM9200 Development Board enables real-time code development and evaluation. It supports the AT91RM9200 ARM9-based 32-bit RISC microcontroller.
- This guide focuses on the AT91RM9200 Development 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.
- 
- 1.2 Deliverables** The development kit is delivered with:
- One AC adapter 100 - 240V ~ 1.0A, 50 - 60 Hz
  - One modem RS232 cable
  - One RJ45 Ethernet crossed cable
  - One A/B-type USB cable
  - Two power supply cables, one US format, one French format
  - 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.
- 
- 1.3 The AT91RM9200 Development Board** The board consists of an AT91RM9200 together with the following:
- 2M bytes of parallel Flash memory
  - Four banks of 2M x 32-bit SDRAM
  - 128K bytes of EEPROM with two-wire interface access

Overview

- 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

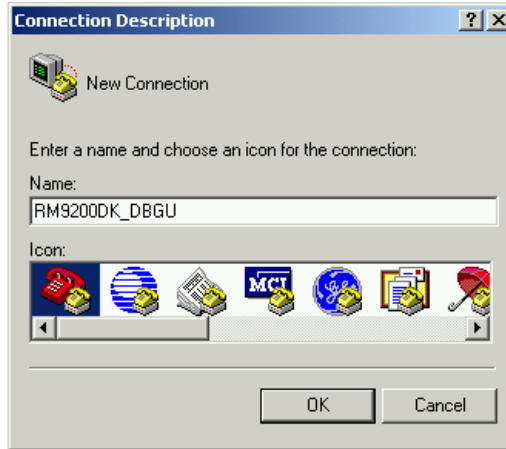
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# Setting Up the AT91RM9200 Development Board

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- 2.1 Electrostatic Warning** 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.
- 
- 2.2 Requirements** In order to connect the AT91RM9200 development board, the following elements are required:
- The AT91RM9200 development board itself
  - Power supply cable capable of supplying 7V to 12V at 1A (not supplied)
- 
- 2.3 Powering Up the Board** 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.
- The board has a voltage regulator providing +3.3V. The regulator allows the input voltage range to be from 7V to 12V.

## 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".



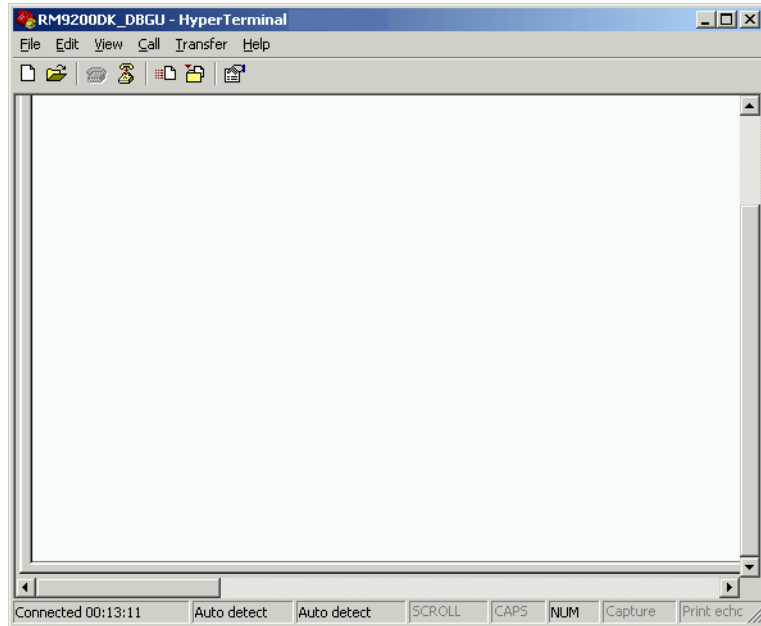
- Click on *OK*.
- In the window *Connect To*, click on the drop-down list arrow at *Connect using:*. Select the COM port used.



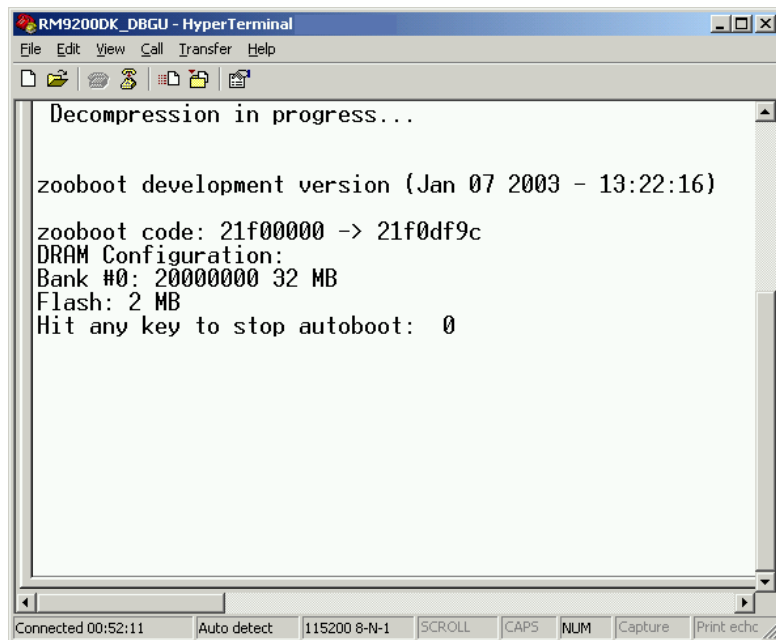
- Click on *OK*.
- Set the serial parameters of the COM port as follows:
  - Bit rate: 115 kbps
  - Data bit: 8
  - Parity: NONE
  - Stop bit: 1
  - Flux control: NONE
- Click on *OK*.



- 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<sup>®</sup> Socket
- CompactFlash<sup>®</sup> 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

- 
- 3.7 Remote Communication**
- Fast Ethernet Physical Layer Single Chip Transceiver
  - IrDA Transceiver
  - Host Interface via RS-232 DB9 male socket
  - Line interface
  - 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
  - On-board buzzer and one LED managed via general PIO lines
- 
- 3.9 Expansion Slots**
- Three expansion slots give access to all the microcontroller's signals
- 
- 3.10 Debug Interface**
- 38-pin trace Port socket
  - 20-pin JTAG interface connector
  - Serial Debug Unit





## 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

<b>Designation</b>	<b>Default Setting</b>	<b>Feature</b>
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

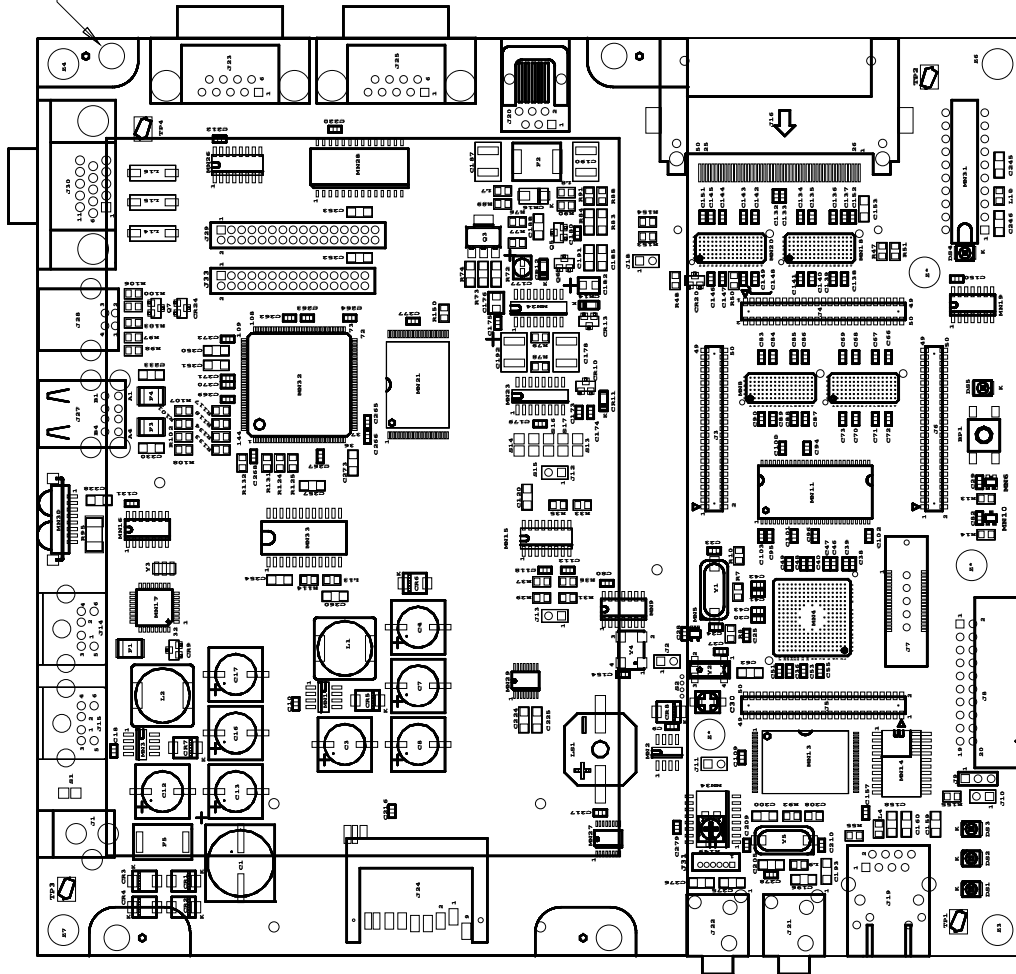
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### 5.1 Schematics

This section contains the following schematics:

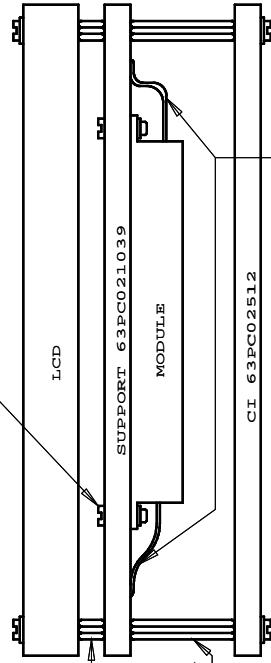
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- AT91RM9200 Board Layout - Bottom View
- Power Supply
- AT91RM9200 Chip
- Buffers
- SDRAM and Flash
- Serial Devices
- PS2 COM Ports
- 3V3 Memory Card
- Ethernet
- DAA
- AC97 Analog Front End
- Serial Interfaces
- Fingerchip
- VGA TFT/CRT Display

VUE FACE ELEMENTS



MONTAGE DU LCD  
SUR SUPPORT 63PC021039 VOIR DETAIL

- 2 VIS CM 2,5X8 INOX A2
- 2 RONDELLES ONDUFLEX DIA.2,5
- 2 ECHOUS IM2,5 INOX A2



4 ENTRETOISES M/F HERA  
M2,5X10 INOX A2

4 ENTRETOISES F/F HERA  
M2,5X25 INOX A2

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

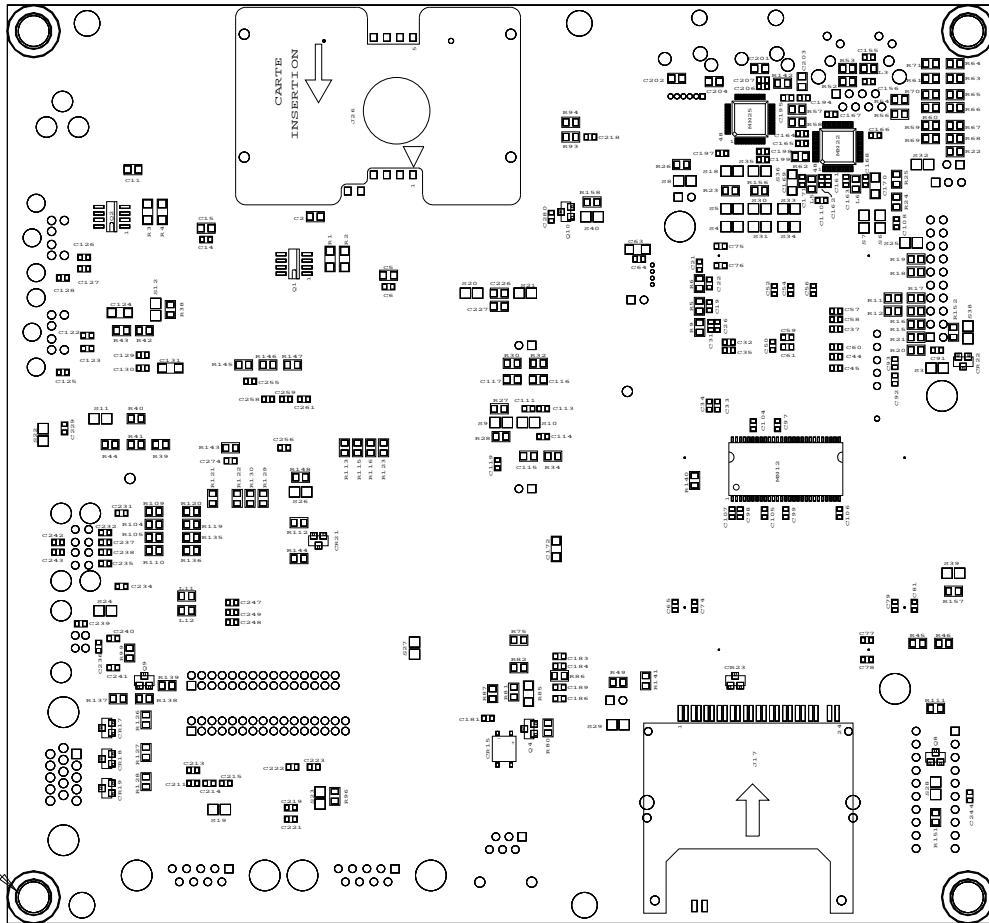
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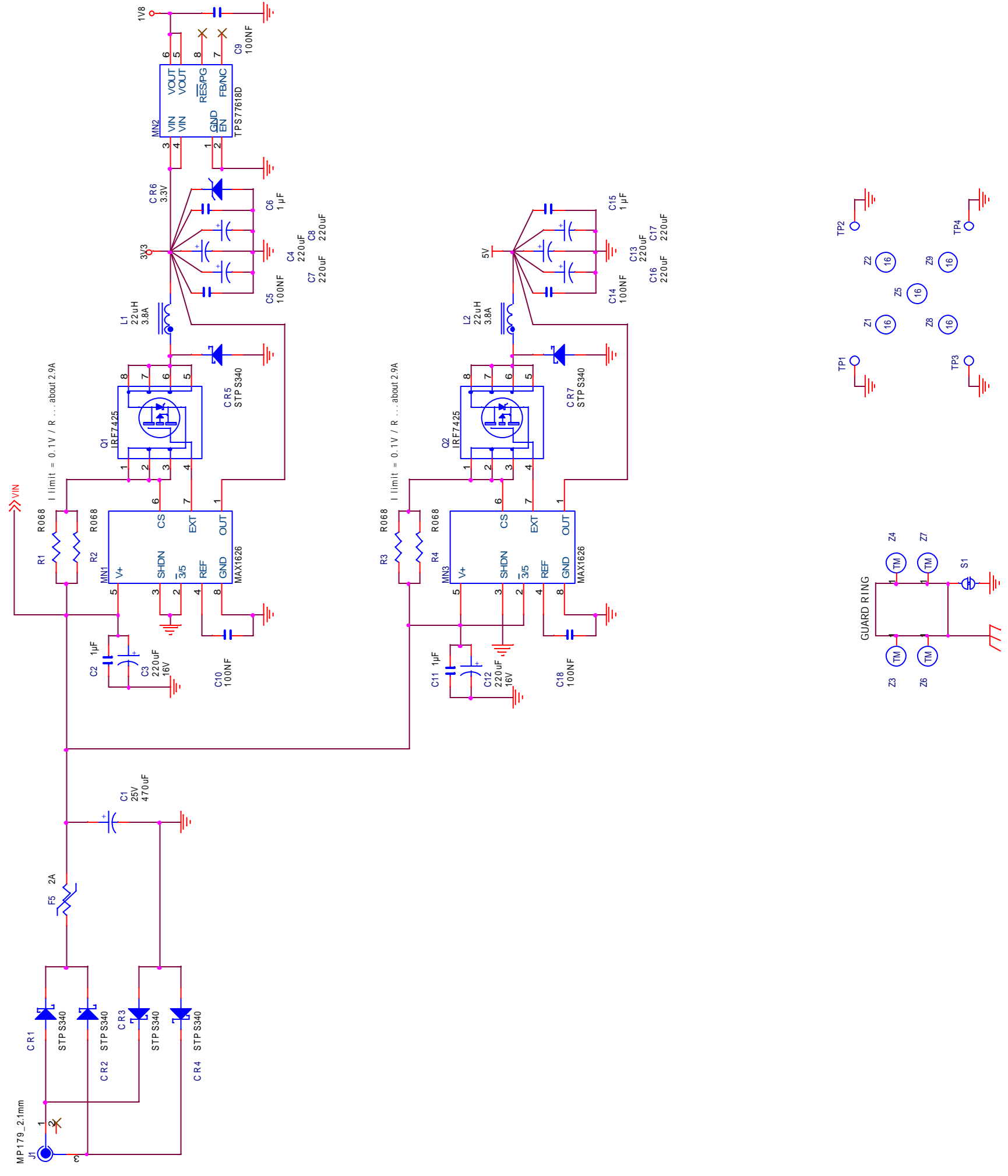
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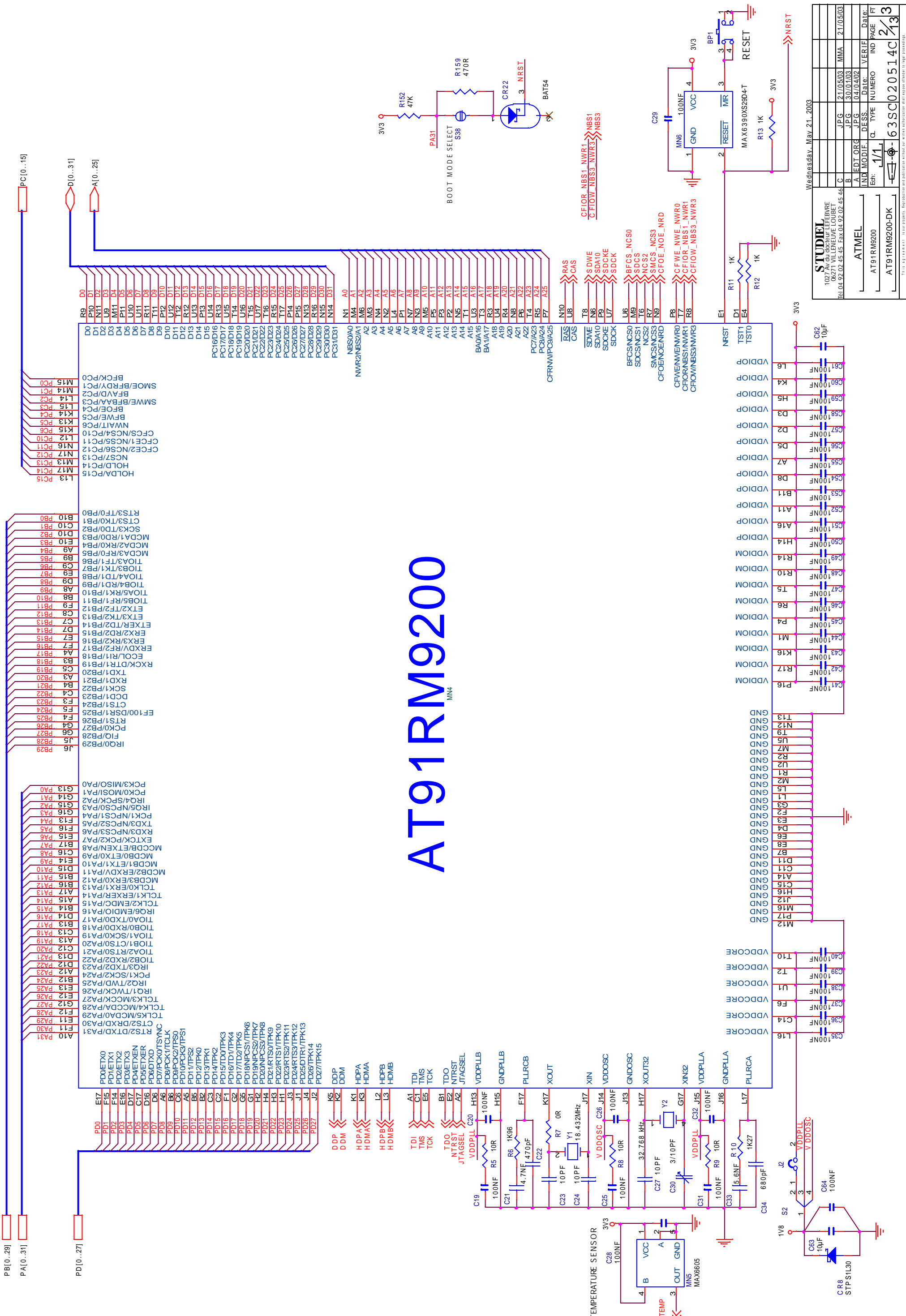


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# AT91RM9200

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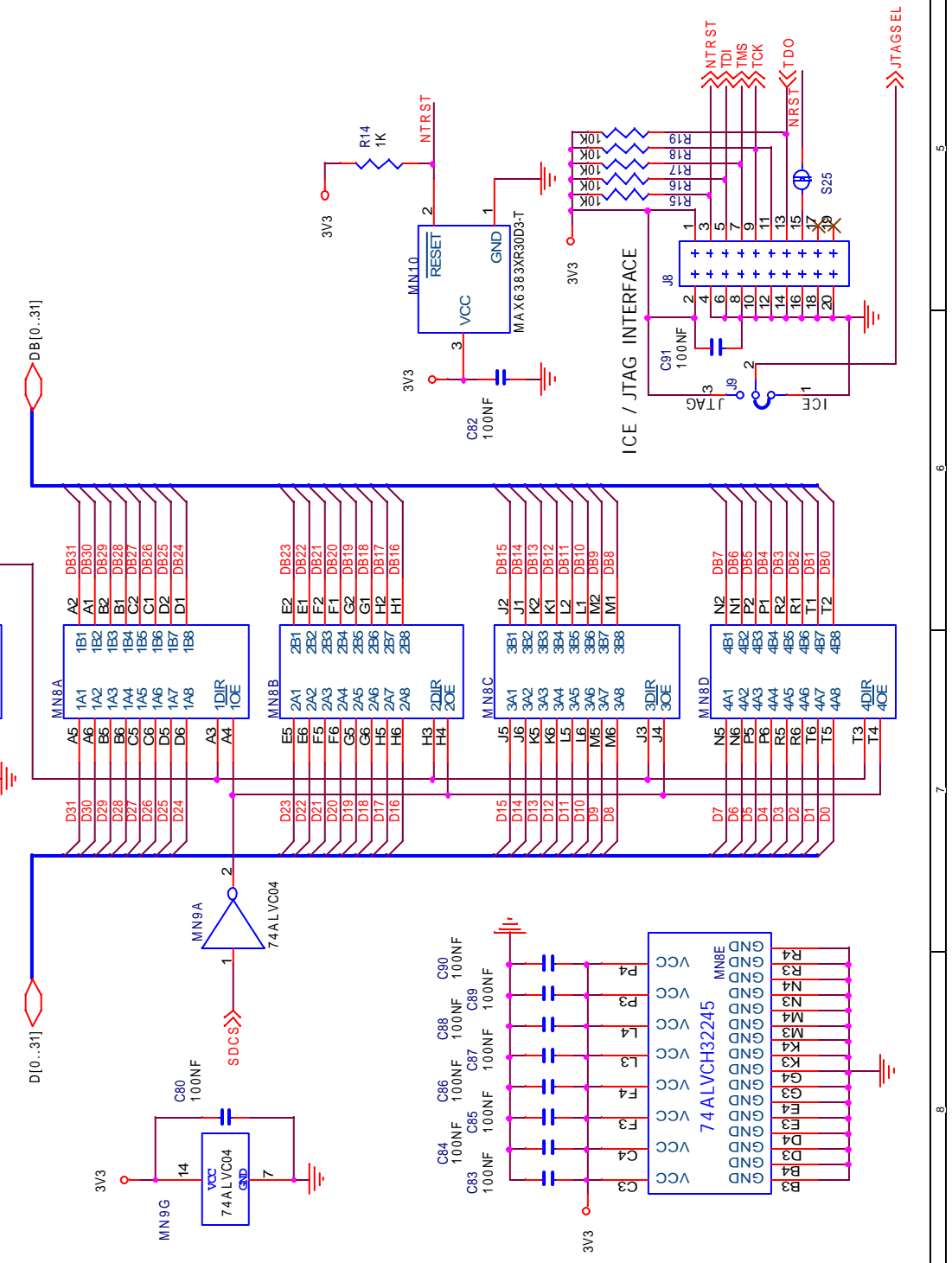
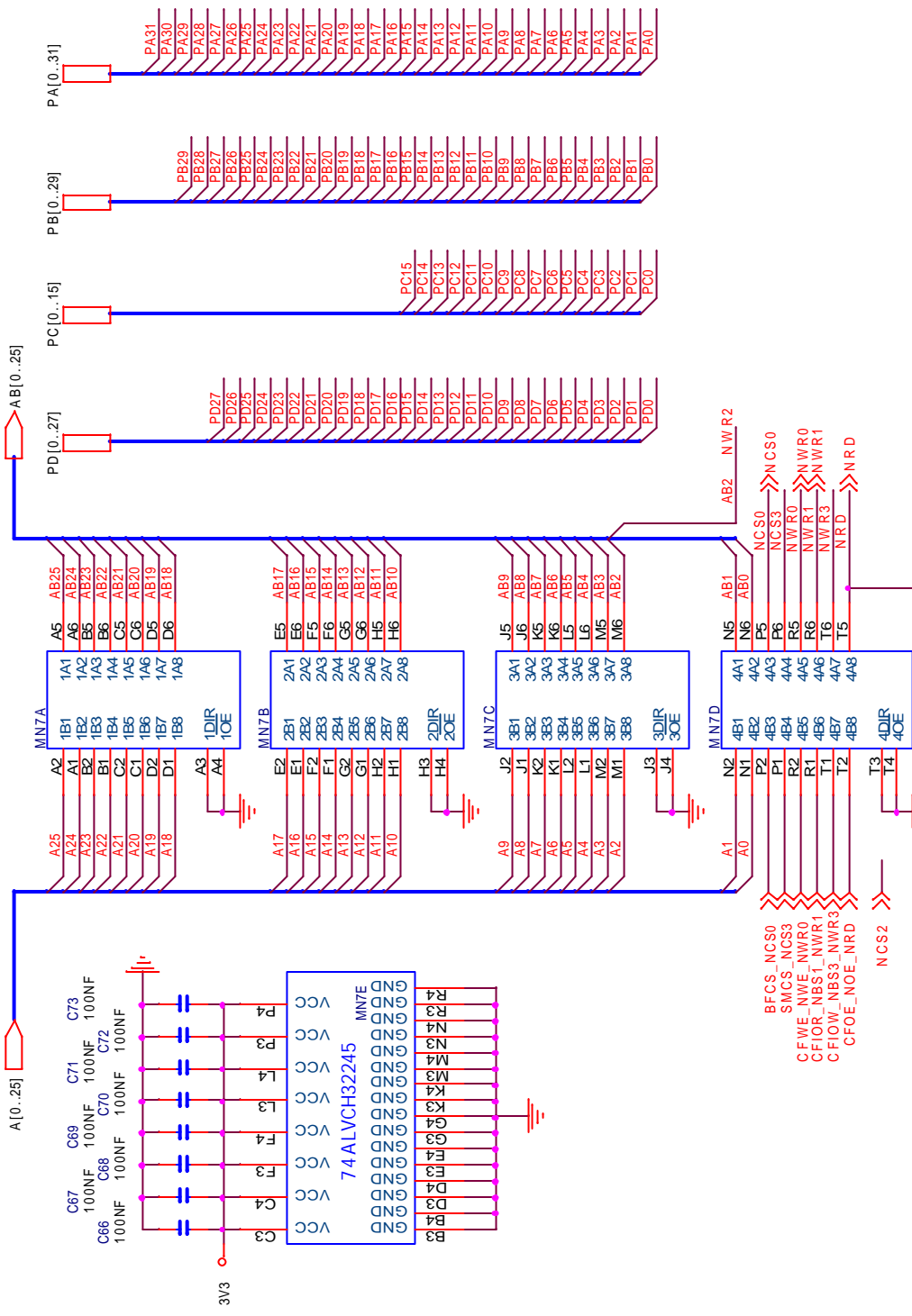
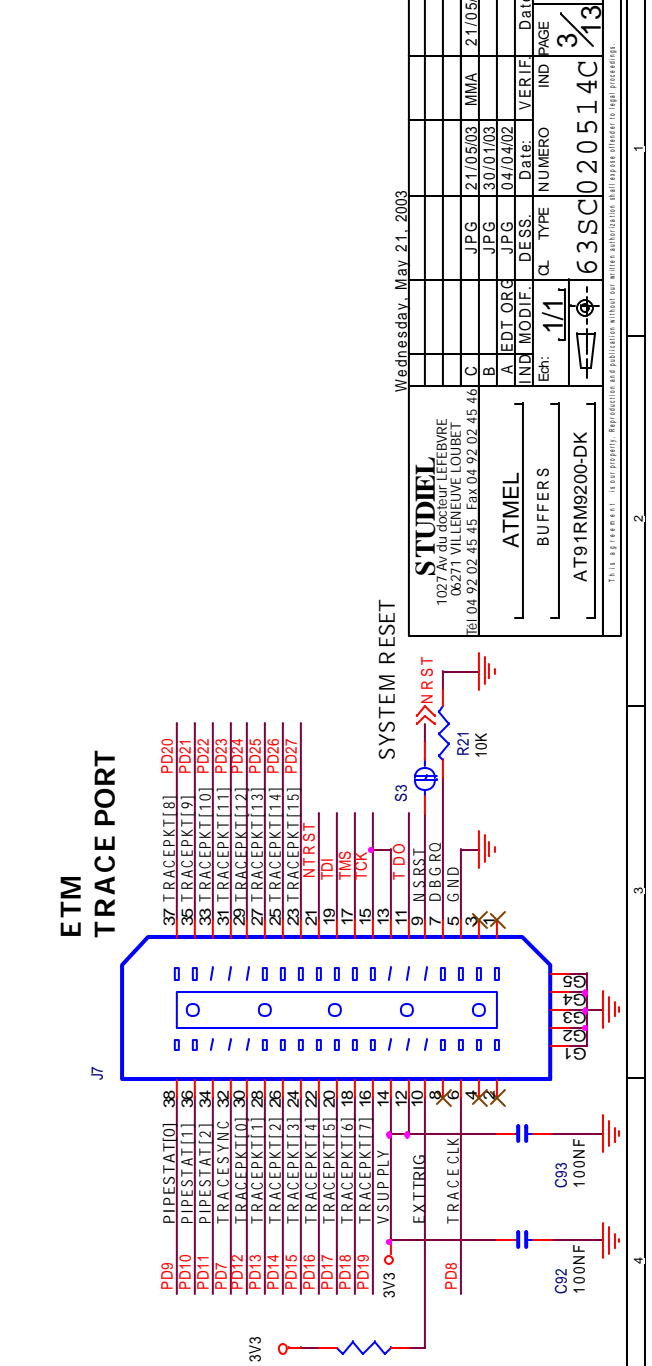
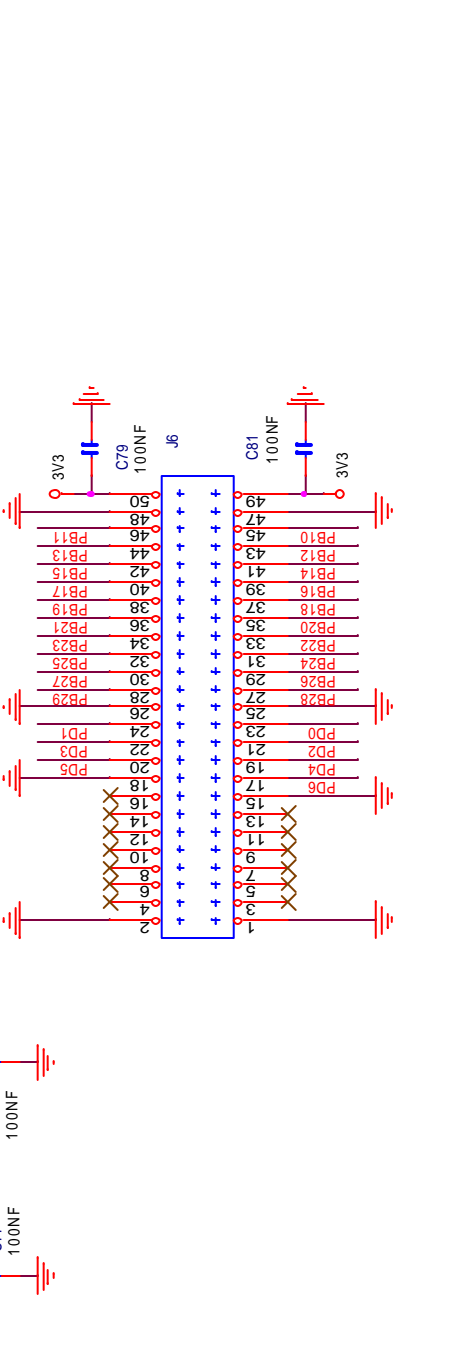
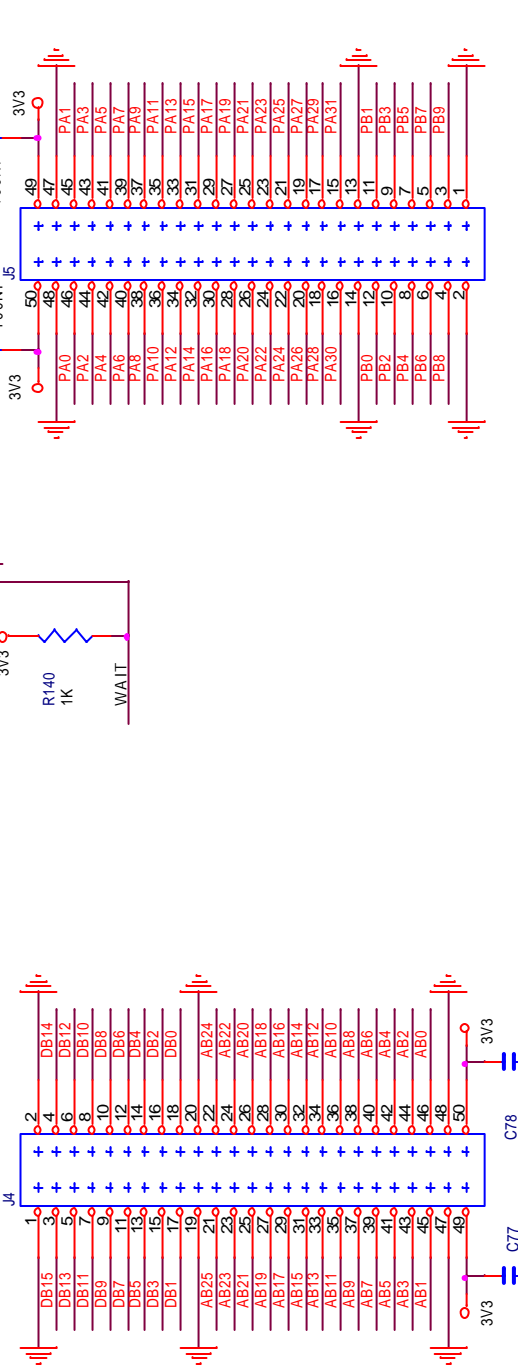
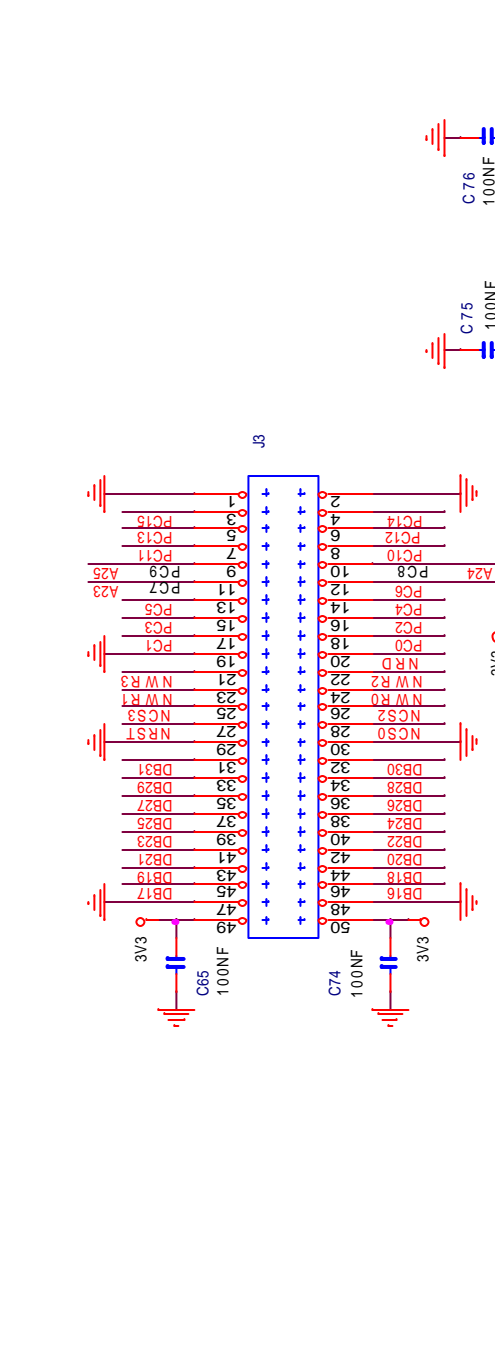
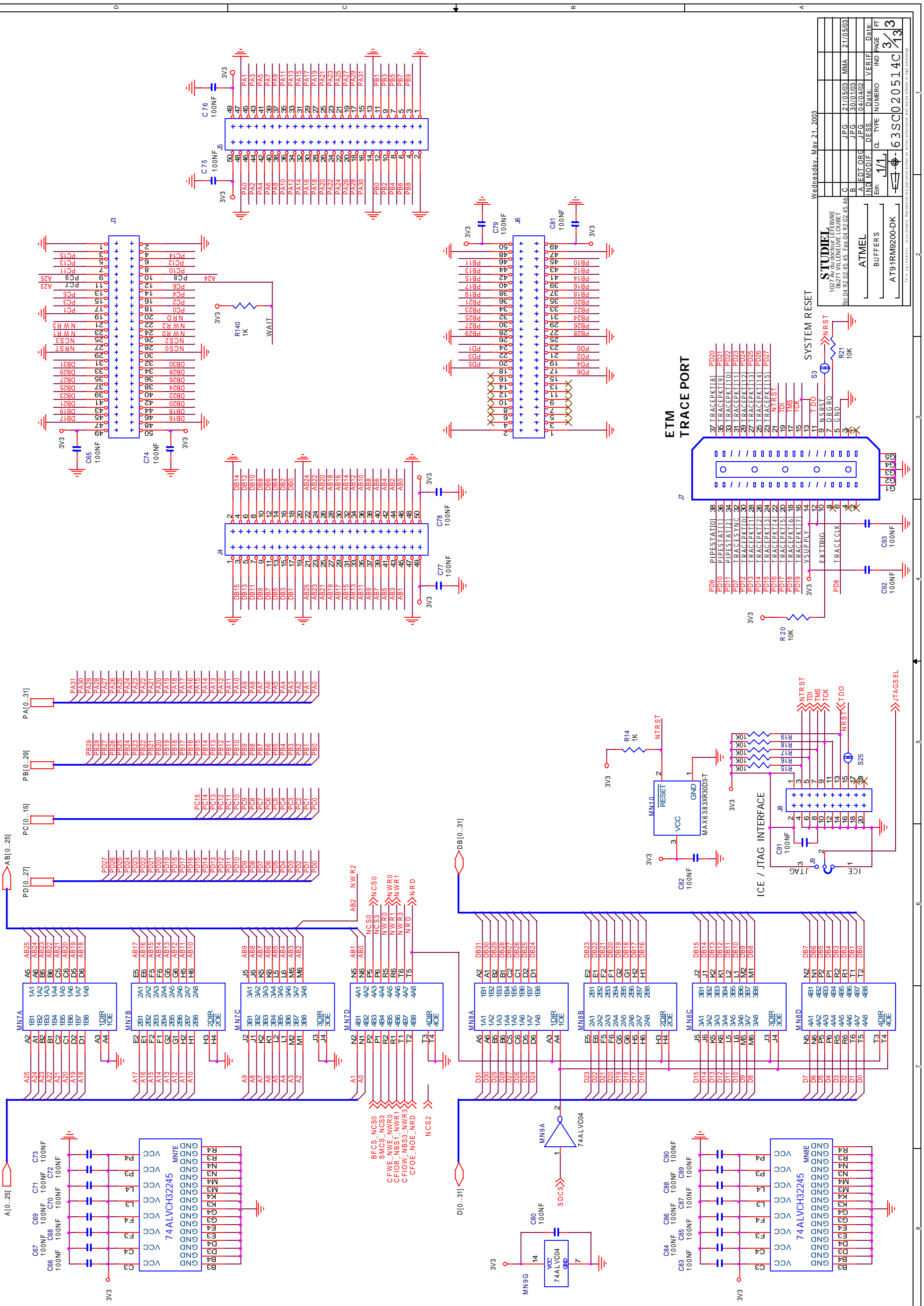
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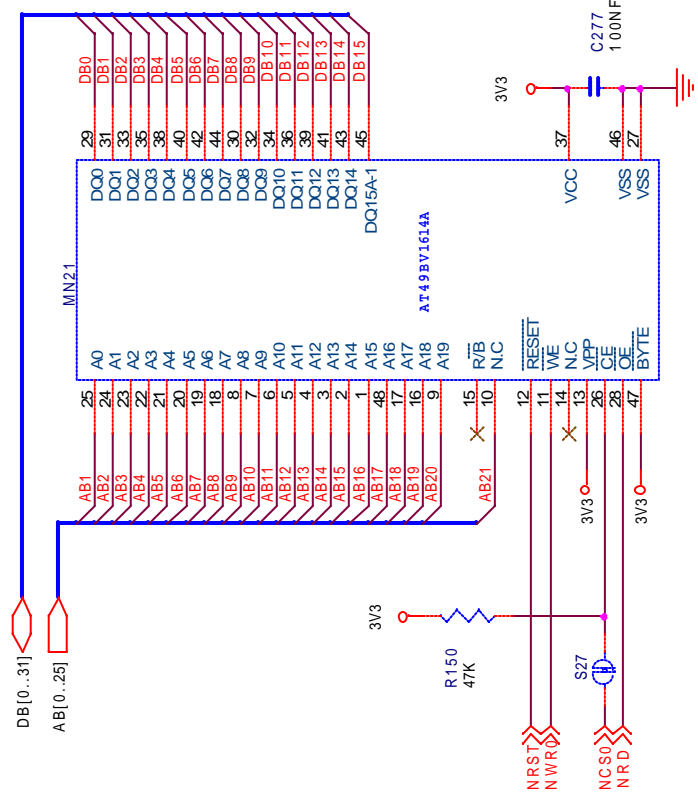
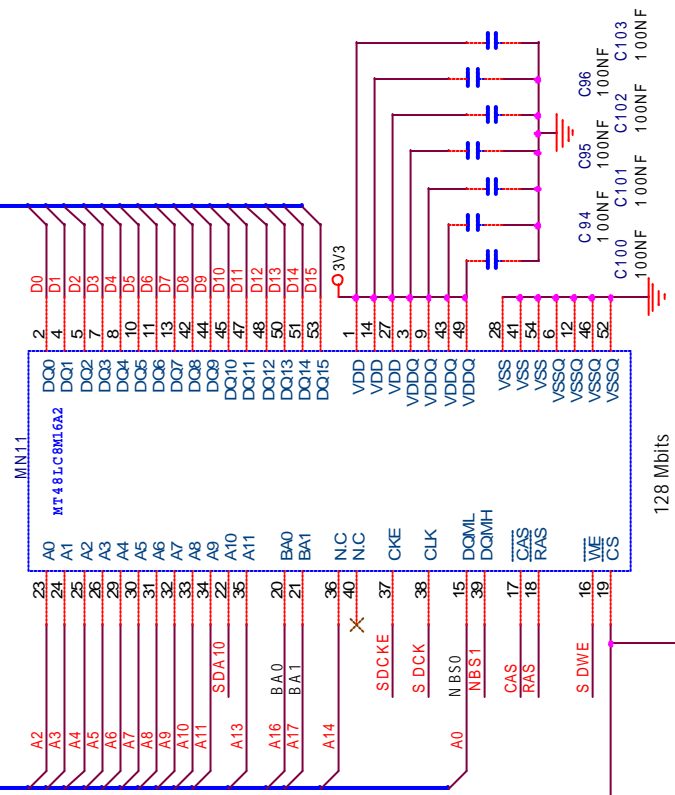
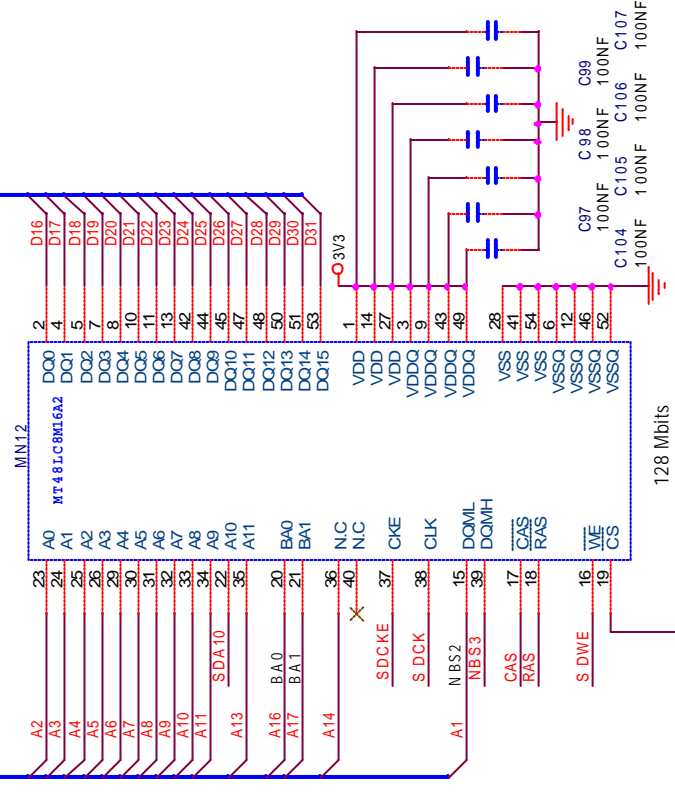
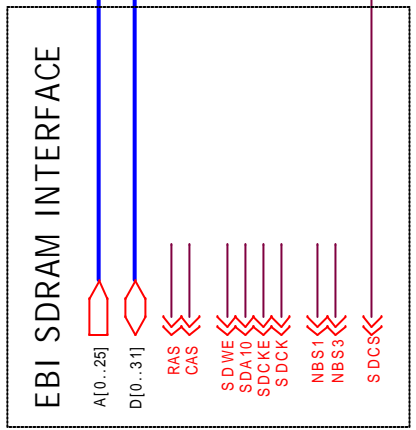


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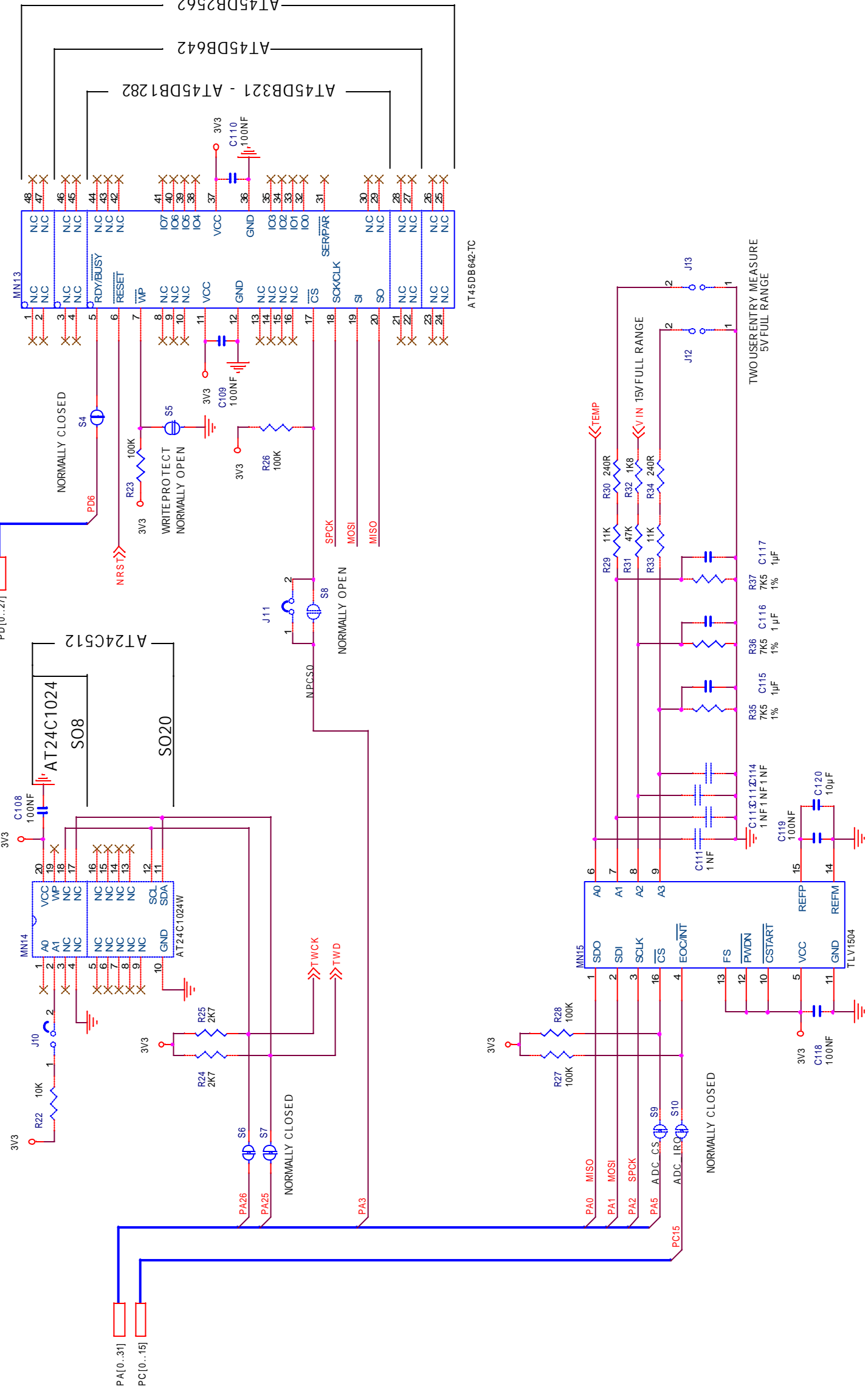




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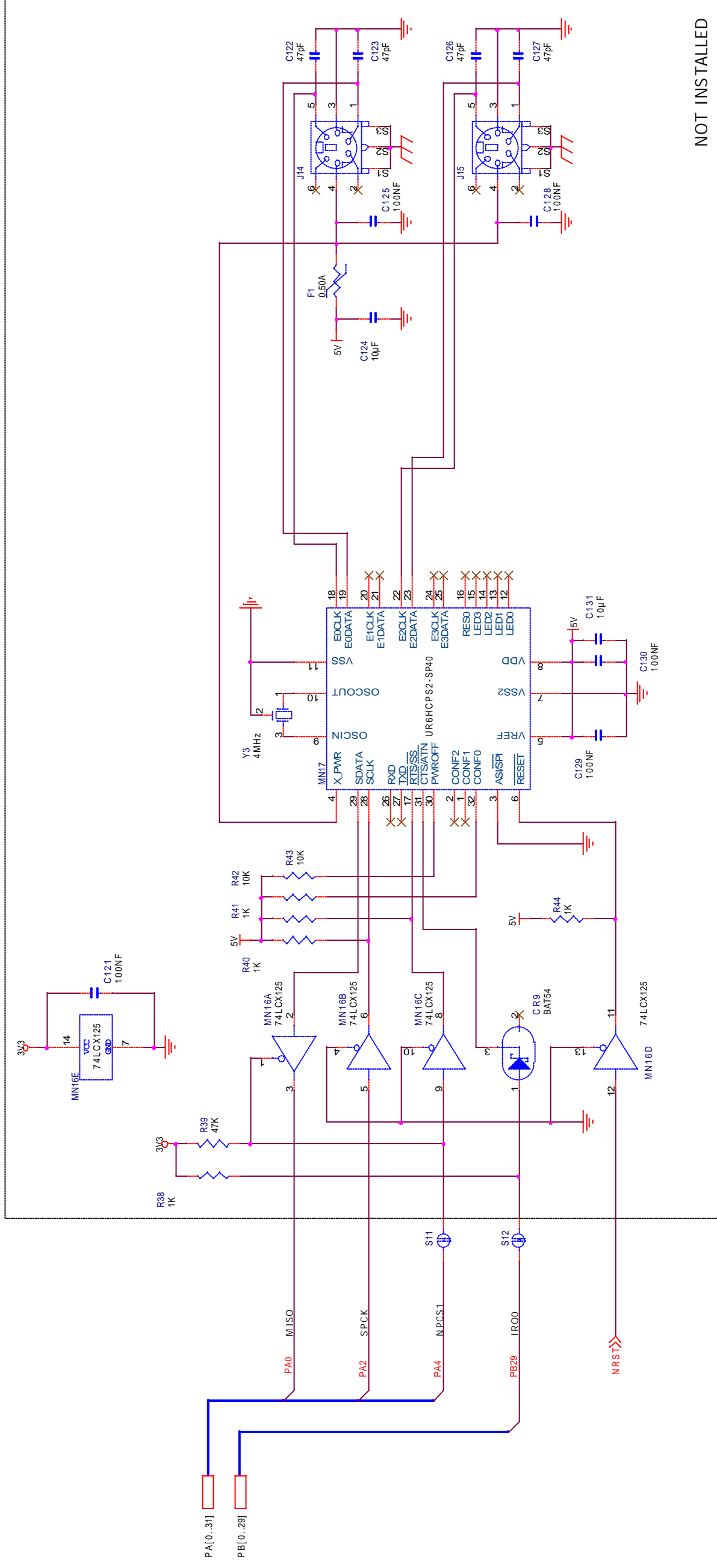
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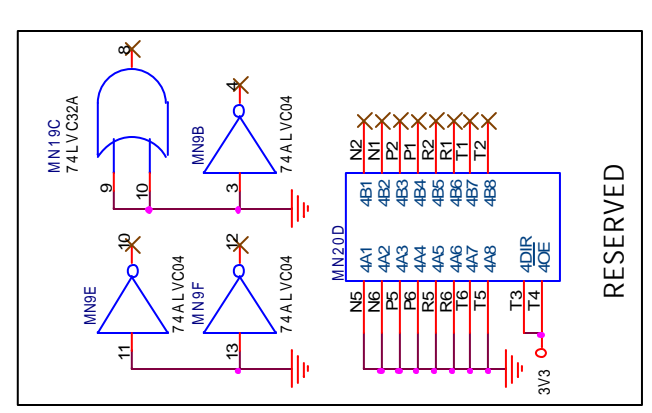
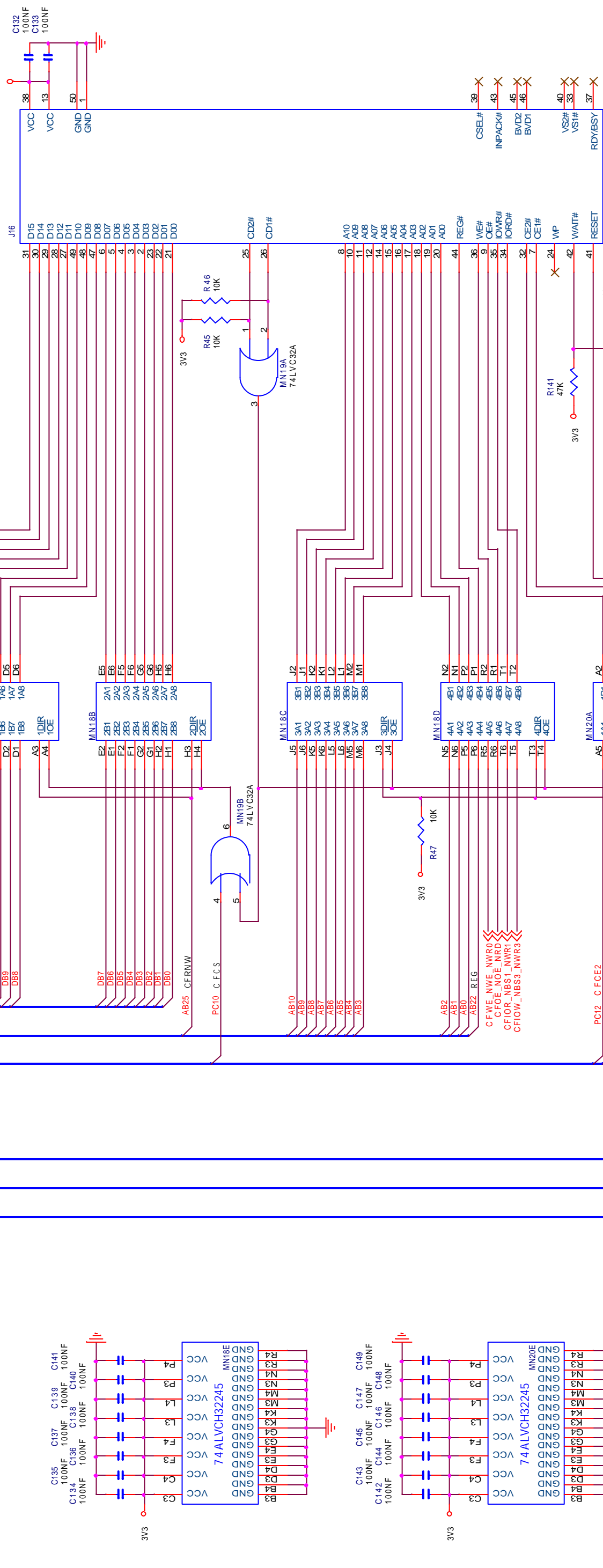
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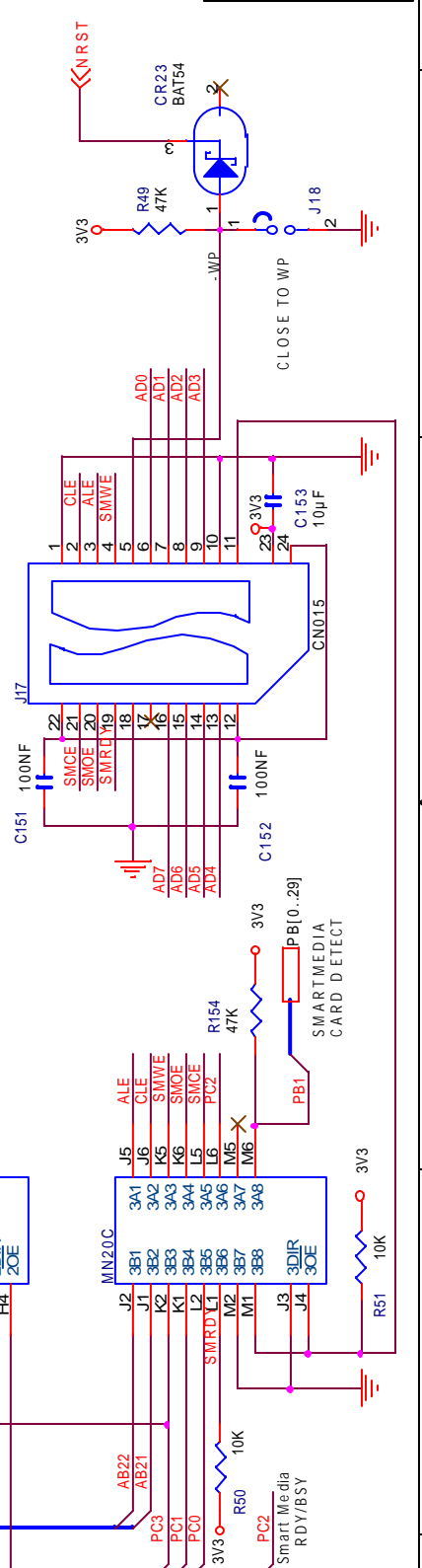
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# COMPACT FLASH CONNECTOR

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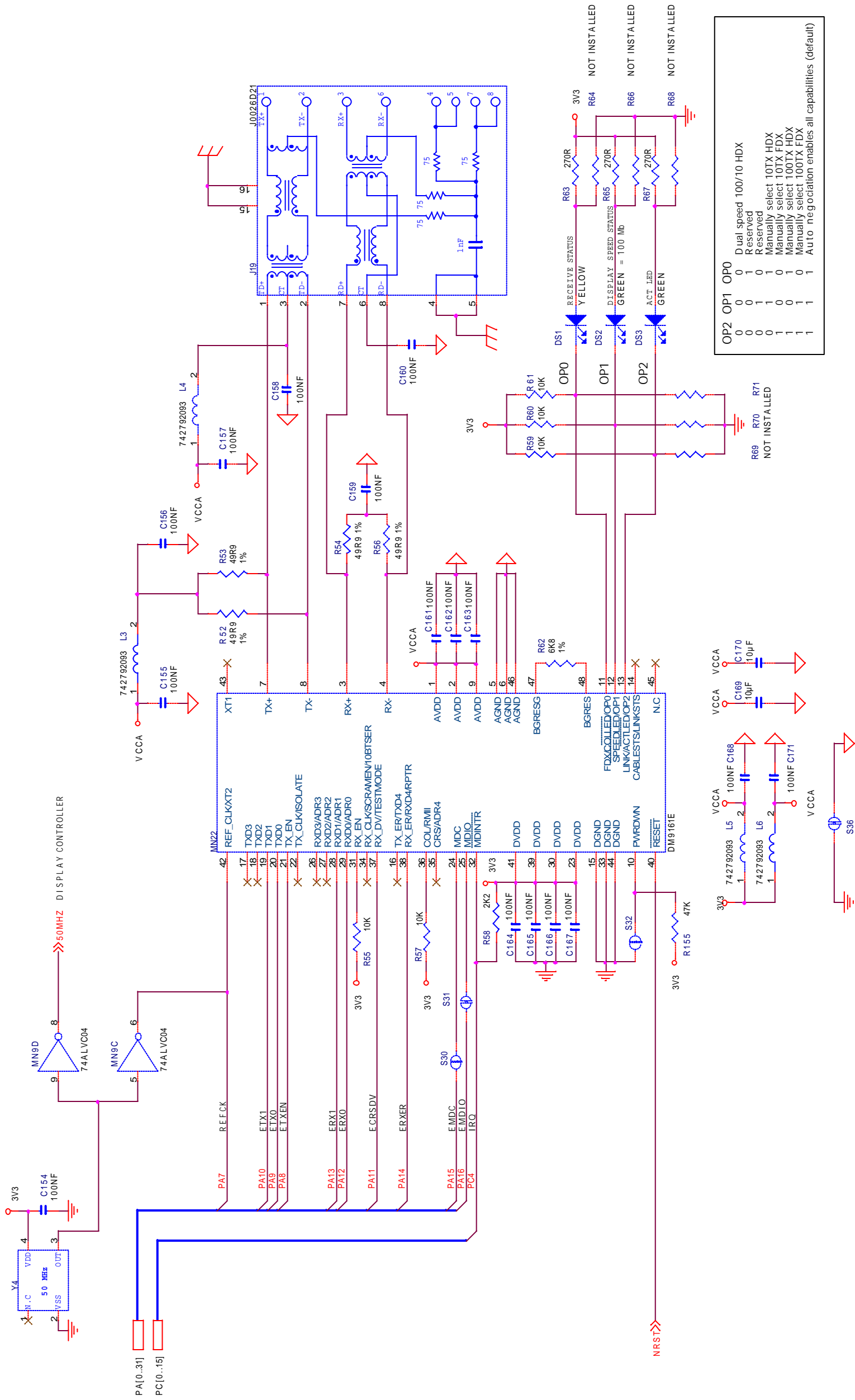


# SMART MEDIA CONNECTOR



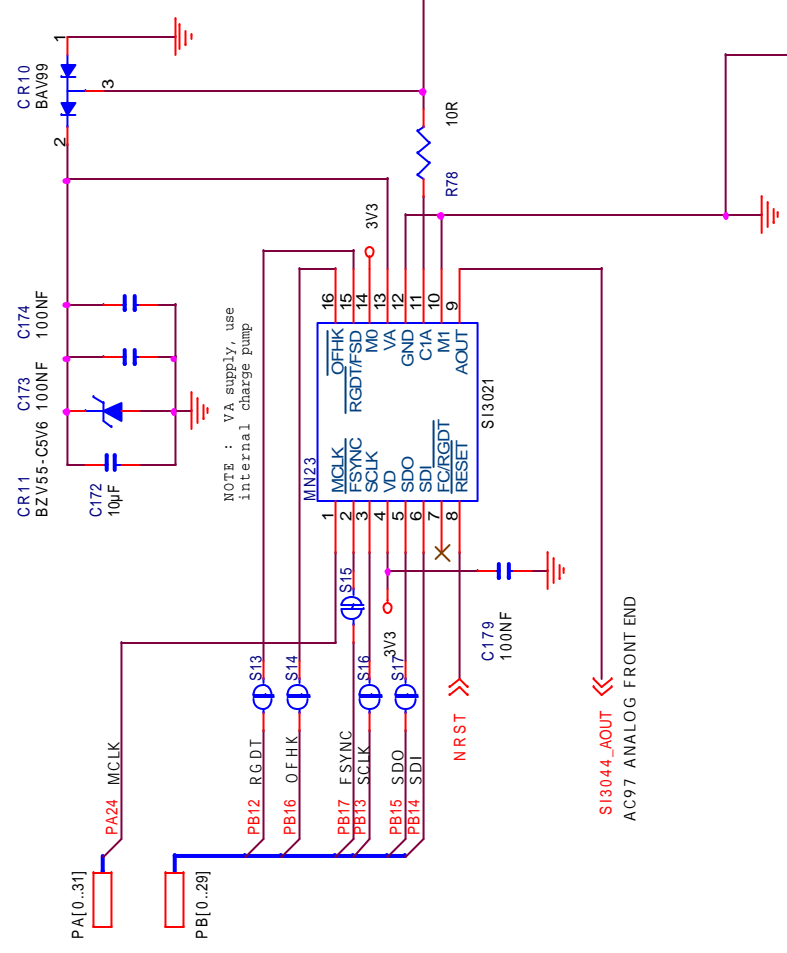
STUDEIL		1027 AV DU GOCHEUR L'EFFEYRE		06271 VILLENEUVE LOURET		TEL: 04.92.02.45.45 Fax: 04.92.02.45.46	
ATMEL		A EDT_ORG		JPG		21/05/03	
3V3 MEMORY CARD		IND_MODIF		JPG		30/01/03	
AT91RM9200-DK		CL_TYPE		JPG		04/04/02	
		NUMERO		VERIF		DATE	
		IND		IND		PAGE	
		FT		FT		FT	
		63SC020514C		7/3			

Wednesday, May 21, 2003

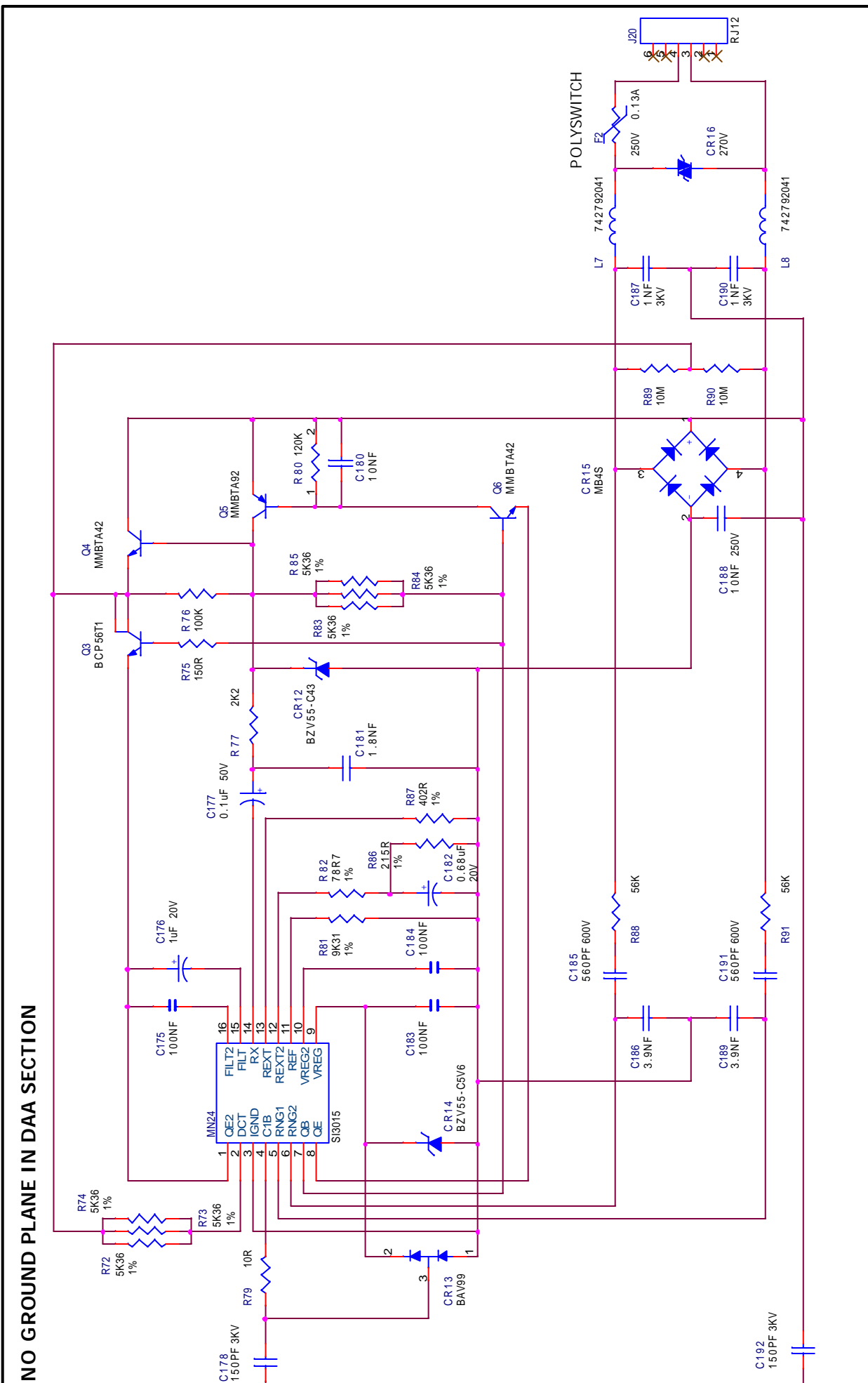


Wednesday, May 21, 2003

<b>STUDEL</b>		1027 AV DU GOUCROT LEFEBVRE	
06271 VILLENEUVE LOUBET		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	
A	EDIT_ORG	JPG	04/04/02
IND	MODIF.	DESS.	Date:
Ech:	1/1	CL	TYPE
		NUMERO	IND
			PAGE
			FT
63SC020514C			8/3



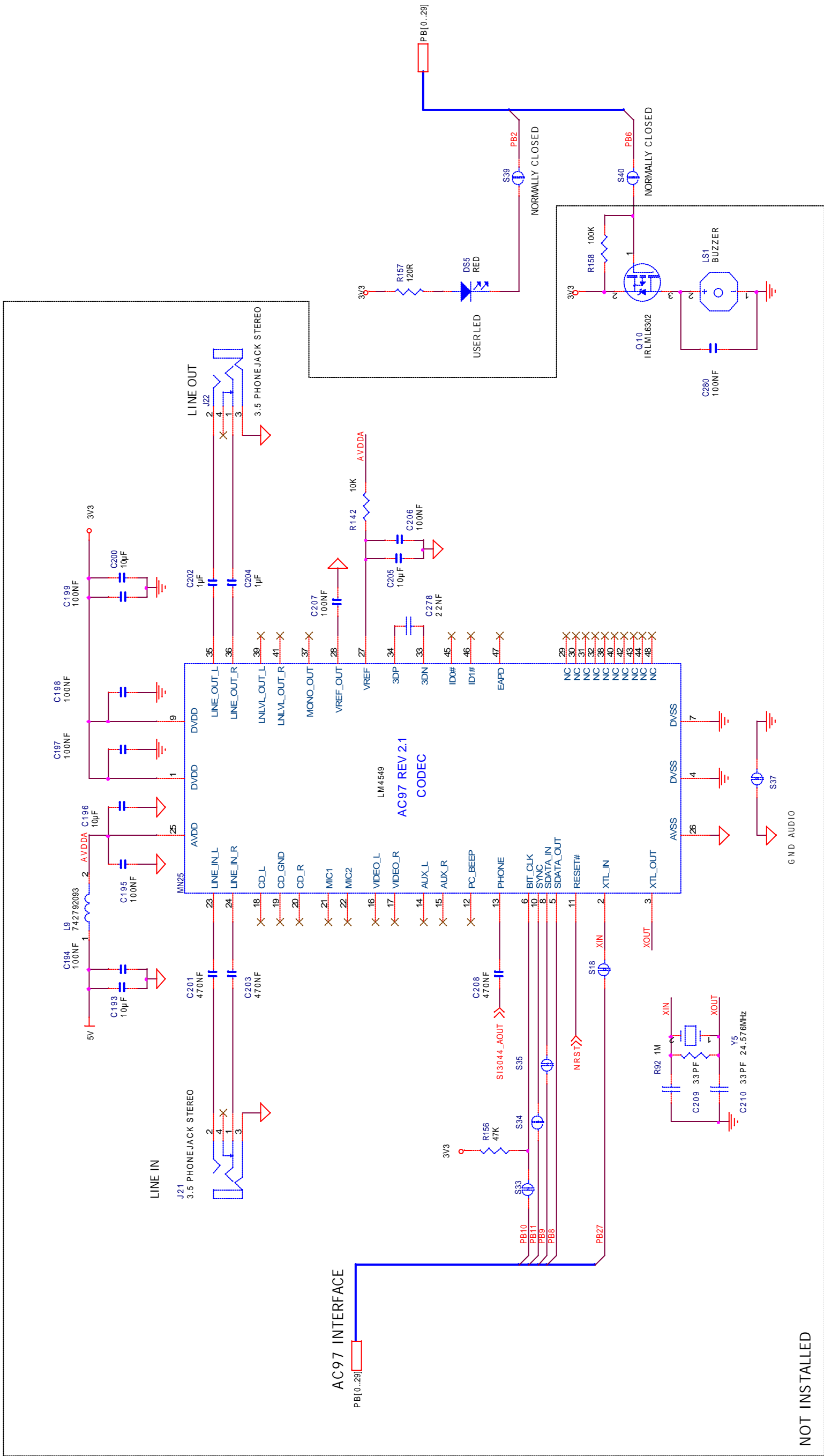
**NO GROUND PLANE IN DAA SECTION**



Wednesday, May 21, 2003

STUDEI		1027 AV DU GOCOURT LEFFEBVRE		21/05/03	
06271 VILLENEUVE LOUBRET		JPG		MMA	
Tel: 04.92.02.45.45 Fax: 04.92.02.45.46		JPG		30/01/03	
A		EDIT_ORG		Date:	
B		ND_MODIF		VERIF	
C		CL		TYPE	
D		NUMERO		IND	
E		PAGE		FT	
Ech: 1/1		63SC020514C		9/3	
ATMEL		DAA		AT91RM9200-DK	

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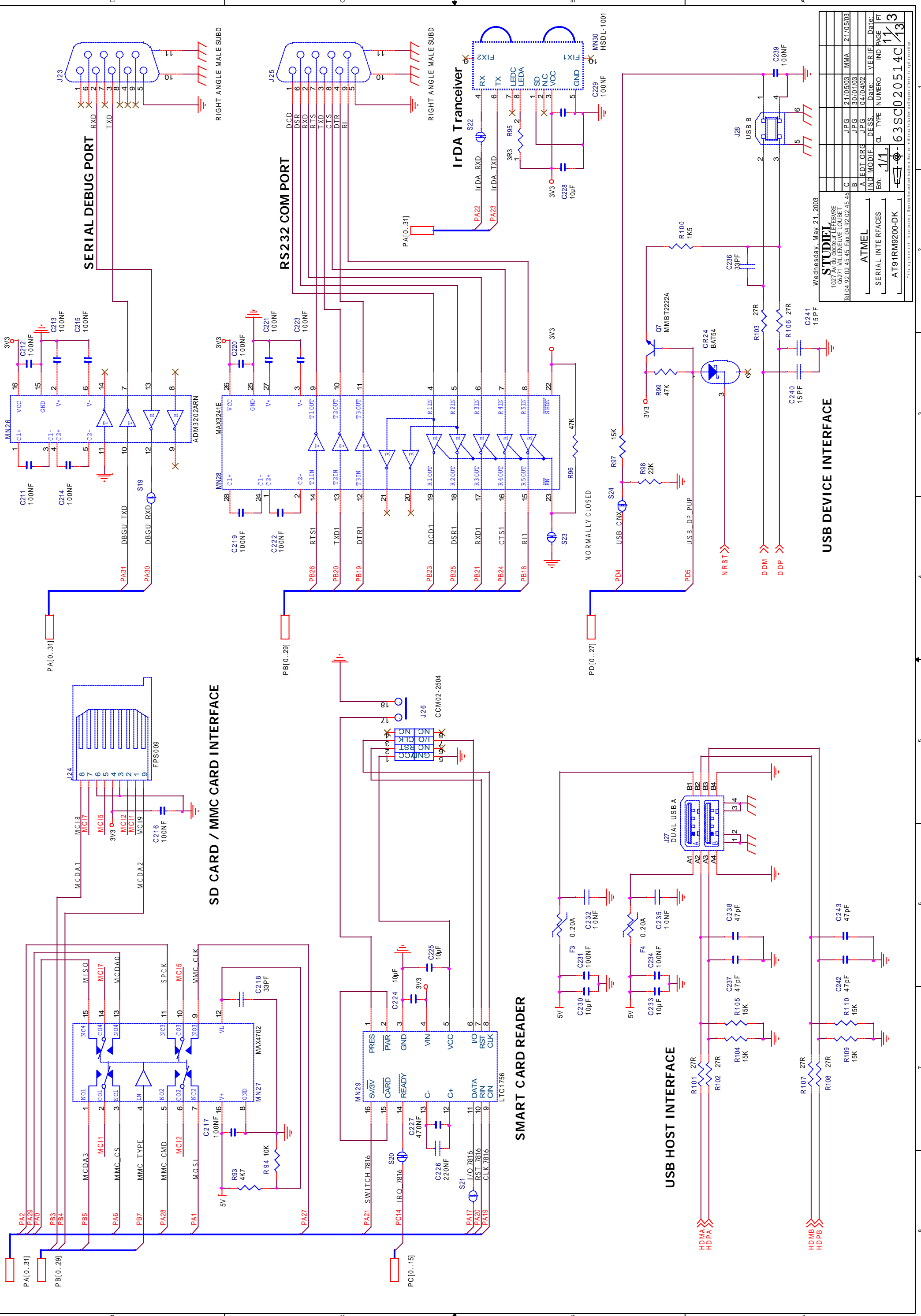


AC97 INTERFACE

NOT INSTALLED

Wednesday, May 21, 2003

<b>STUDEL</b>		1027 AV DU GOUCROUT LEFFEBVRE	
06271 VILLENEUVE LOUBET		21/05/03 MMA 21/05/03	
06104.92.02.45.45 Fax:04.92.02.45.46		30/01/03	
ATMEL		Date: 04/04/02	
AC97 ANALOG FRONT END		VERIF: 1/1	
AT91RM9200-DK		IND PAGE 10	
63SC020514C		IND PAGE 13	



Wednesday, May 21, 2003

**STUDEIL**  
 1027 AV DU GOCROUT LEFFEBVRE  
 06271 VILLENEUVE LOUBRET  
 TEL:04.92.02.45.45 Fax:04.92.02.45.46

CL	TYPE	NUMERO	IND	PAGE	FT
1/1					

ATMEL  
 SERIAL INTE RFACES  
 AT91RM9200-DK

63SC020514C  
 11/3

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**USB DEVICE INTERFACE**

**USB HOST INTERFACE**

**SMART CARD READER**

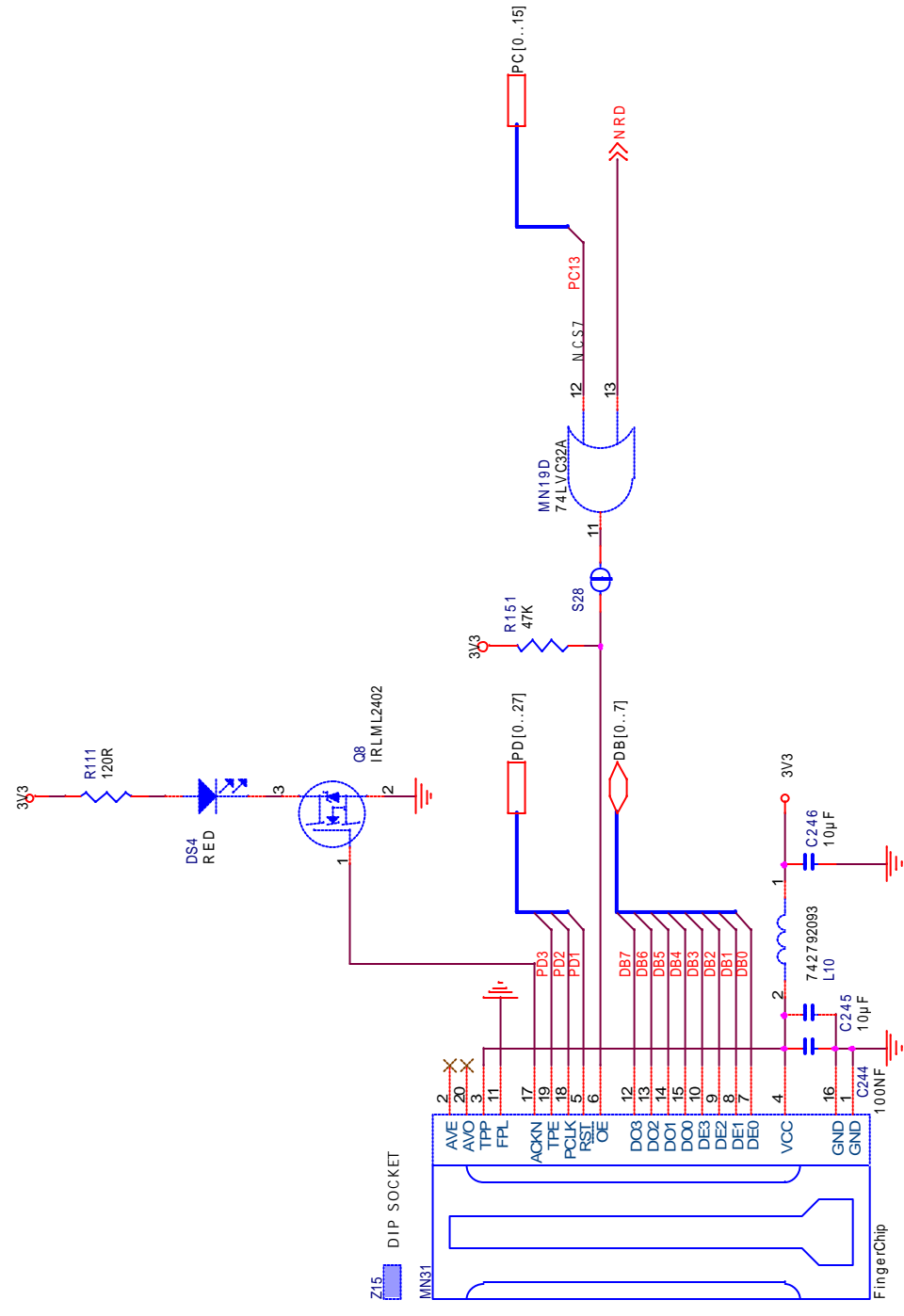
**SD CARD / MMC CARD INTERFACE**

**SERIAL DEBUG PORT**

**RS232 COM PORT**


**IrDA Transceiver**

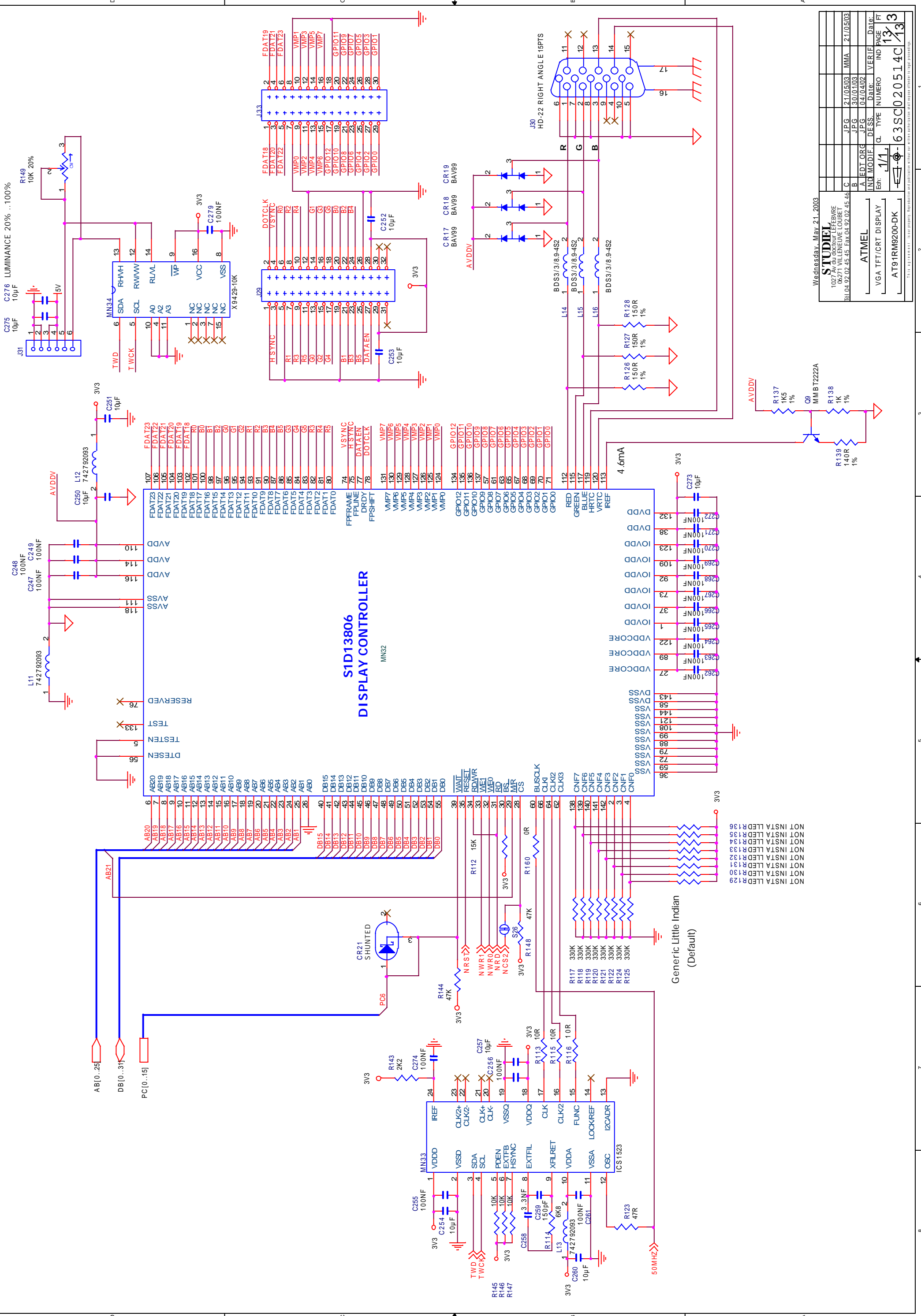




**DO NOT SOLDER**

Wednesday, May 21, 2003

<b>STUDEL</b>		1027 AV DU GOCHEUR LEFFEBVRE 06271 VILLENEUVE LOUBET Tel:04.92.02.45.45 Fax:04.92.02.45.46		
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B	JPG	30/01/03		
A	JPG	04/04/02		
EDIT. ORG.		DESS.		VERIF.
IND. MODIF.		Date:		
Ech: 1/1		CL. TYPE		NUMERO
FINGERCHIP		IND		PAGE
AT91RM9200-DK		63SC020514C		12/13
				



**SID13806  
DISPLAY CONTROLLER**

Generic Little Indian  
(Default)

Wednesday, May 21, 2003

STUDEIL		1027 AV DU GOCOURT LEFFEBVRE	
06271 VILLENEUVE LOUBET		21/05/03 MMA 21/05/03	
06104 92 02 45 45 Fax: 04 92 02 45 46		30/01/03	
ATMEL		Date: VERIF	
VGA TFT/CRT DISPLAY		IND PAGE	
Ech: 1/1		NUMERO 13	
AT91RM9200-DK		IND PAGE FT	
		13/3	



## Atmel Corporation

2325 Orchard Parkway  
San Jose, CA 95131  
Tel: 1(408) 441-0311  
Fax: 1(408) 487-2600

## Regional Headquarters

### Europe

Atmel Sarl  
Route des Arsenalux 41  
Case Postale 80  
CH-1705 Fribourg  
Switzerland  
Tel: (41) 26-426-5555  
Fax: (41) 26-426-5500

### Asia

Room 1219  
Chinachem Golden Plaza  
77 Mody Road Tsimshatsui  
East Kowloon  
Hong Kong  
Tel: (852) 2721-9778  
Fax: (852) 2722-1369

### Japan

9F, Tonetsu Shinkawa Bldg.  
1-24-8 Shinkawa  
Chuo-ku, Tokyo 104-0033  
Japan  
Tel: (81) 3-3523-3551  
Fax: (81) 3-3523-7581

## Atmel Operations

### Memory

2325 Orchard Parkway  
San Jose, CA 95131  
Tel: 1(408) 441-0311  
Fax: 1(408) 436-4314

### Microcontrollers

2325 Orchard Parkway  
San Jose, CA 95131  
Tel: 1(408) 441-0311  
Fax: 1(408) 436-4314

La Chantrerie  
BP 70602  
44306 Nantes Cedex 3, France  
Tel: (33) 2-40-18-18-18  
Fax: (33) 2-40-18-19-60

### ASIC/ASSP/Smart Cards

Zone Industrielle  
13106 Rousset Cedex, France  
Tel: (33) 4-42-53-60-00  
Fax: (33) 4-42-53-60-01

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

Scottish Enterprise Technology Park  
Maxwell Building  
East Kilbride G75 0QR, Scotland  
Tel: (44) 1355-803-000  
Fax: (44) 1355-242-743

### RF/Automotive

Theresienstrasse 2  
Postfach 3535  
74025 Heilbronn, Germany  
Tel: (49) 71-31-67-0  
Fax: (49) 71-31-67-2340

1150 East Cheyenne Mtn. Blvd.  
Colorado Springs, CO 80906  
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  
Fax: (33) 4-76-58-34-80

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### e-mail

[literature@atmel.com](mailto:literature@atmel.com)

### Web Site

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