



## Introduction

This user guide introduces the evaluation kits for the Atmel® SAMA5D3 series embedded MPUs listed below:

- SAMA5D31
- SAMA5D33
- SAMA5D34
- SAMA5D35
- SAMA5D36

It pertains to the following evaluation kit references:

- SAMA5D31-EK
- SAMA5D33-EK
- SAMA5D34-EK
- SAMA5D35-EK
- SAMA5D36-EK

## Contents

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**Important:** Unpack and assemble the kit carefully, following the assembly guide provided in the box.

- Boards
  - One SAMA5D3 main board (MB)
  - One of the five available CPU module (CM) boards
    - SAMA5D31-CM
    - SAMA5D33-CM
    - SAMA5D34-CM
    - SAMA5D35-CM
    - SAMA5D36-CM
  - One optional Display Module (DM) board (5"\_WVGA\_R-DM), available for all SAMA5D3x evaluation kits that feature an LCD interface: SAMA5D31, SAMA5D33, SAMA5D34, SAMA5D36
- Power supply
  - One universal input AC/DC power supply with US, Europe and UK plug adapters
  - One 3V lithium battery type CR1225
- Cables
  - One micro A/B-type USB cable
  - One RJ45 crossed cable
- A welcome letter

## Related Items

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- [Atmel SAMA5D3 Series Datasheet](#)

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# 1. Evaluation Kit Specifications

Table 1-1. Evaluation Kit Specifications

| Characteristic                                                                            | Specifications                                                          |
|-------------------------------------------------------------------------------------------|-------------------------------------------------------------------------|
| Clock speed                                                                               | Up to 536 MHz PCK, up to 166 MHz MCK                                    |
| Ports                                                                                     | 10/100/1000 Ethernet, USB, RS232, JTAG, CAN, Audio, HDMI, SD card       |
| Board supply voltage                                                                      | 5V DC from connector                                                    |
| Dimensions:<br>MB (Main Board)<br>CM (Computer Module) Board<br>DM (Display Module) Board | 165 * 135 * 20 mm<br>67.60 * (40 to 47) * 5 mm<br>135 * 80 * 6 mm       |
| RoHS status                                                                               | Compliant                                                               |
| CE and FCC Part 15 status                                                                 | Compliant                                                               |
| Kit Identification                                                                        | SAMA5D31-EK<br>SAMA5D33-EK<br>SAMA5D34-EK<br>SAMA5D35-EK<br>SAMA5D36-EK |

## 1.1 Electrostatic Warning

**Warning:** ESD-Sensitive Electronic Equipment!

The evaluation kit is shipped in a protective anti-static package. The board system must not be subjected to high electrostatic potentials.

We strongly recommend using a grounding strap or similar ESD protective device when handling the board in hostile ESD environments (offices with synthetic carpet, for example). Avoid touching the component pins or any other metallic element on the board.

## 2. Power Up

### 2.1 Power up the Board

Unpack the board, taking care to avoid electrostatic discharge. Unpack the power supply, select the right power plug adapter corresponding to that of your country and insert it in the power supply.

Connect the power supply DC connector to the board and plug the power supply to an AC power plug.

The LCD should light up and display a welcome page. Click or touch icons displayed on the screen and view the demo (the red ones need to be replaced by demo software).

### 2.2 Sample Code and Technical Support

After booting up the board, you can run sample code or your own application on the development kit. You can download sample code and get technical support from the [Atmel web site](#).

Linux software and demos can be found on the web site [Linux4SAM](#).

## 3. Evaluation Kit Hardware

### 3.1 Introduction

The Atmel SAMA5D3 series evaluation kit is a fully-featured evaluation platform for Atmel SAMA5D3 series microcontrollers. The evaluation kit allows users to extensively evaluate, prototype and create application-specific designs.

The Atmel SAMA5D3 series evaluation kit is a platform architecture based on a main board, a computer module equipped with a SAMA5D3 series processor and an optional display module, providing maximum flexibility for kit users.

The SAMA5D3 series evaluation kit consists of three boards:

- The computer module (CM) board, is a single-board computer that integrates all the core components and is mounted onto an application-specific main board (MB). The computer module has specified pinouts based on the SODIMM200 connector. It provides the functional requirements for an embedded application. These functions include, but are not limited to, graphics, audio, mass storage, network and multiple serial and USB ports. A single SODIMM200 connector provides the main board interface to carry all the I/O signals to and from the computer module.
- The main board (MB) provides all the interface connectors required to attach the system to the application specific peripherals. This versatility allows the designer to create a densely-packed solution, which results in a more reliable product while simplifying system integration.
- The display module board (DM) integrates LCD, touchscreen and Qtouch® technology

**Table 3-1. Evaluation Kit Features**

| Feature | SAMA5D31 | SAMA5D33 | SAMA5D34 | SAMA5D35 | SAMA5D36 |
|---------|----------|----------|----------|----------|----------|
| CAN0    |          |          | X        | X        | X        |
| CAN1    |          |          | X        | X        | X        |
| GMAC    |          | X        | X        | X        | X        |
| EMAC    | X        |          |          | X        | X        |
| HSMCI1  | X        | X        | X        | X        | X        |
| HSMCI2  |          | X        | X        | X        | X        |
| LCDC    | X        | X        | X        |          | X        |
| UART0   | X        |          |          | X        | X        |
| UART1   | X        |          |          | X        | X        |
| ISI     | X        | X        | X        | X        | X        |
| SHA     | X        | X        | X        | X        | X        |
| AES     | X        | X        | X        | X        | X        |
| TDES    | X        | X        | X        | X        | X        |
| TC1     | X        | X        | X        | X        | X        |

## 4. CPU Module (CM) Board

### 4.1 Overview

The CPU module (CM) board is the heart of the SAMA5D3x-EK. It connects to the main board through a SODIMM200 interface and integrates the SAMA5D3 series processor and external memories. The CM board serves as a minimal CPU sub-system. All five SAMA5D31, SAMA5D33, SAMA5D34, SAMA5D35 and SAMA5D36 processors share the same CM board circuitry with minor configuration settings.

The CM board connects to a carrier board containing its connectors, power supply and any expansion I/O through a standard gold-plated SODIMM 200-pin connection.

Note: There are five CM boards from three different manufacturers. The five processors are implemented as shown in [Table 4-1](#).

**Table 4-1. CM Board Implementation**

| Manufacturer and Module Kind | SAMA5D31-CM | SAMA5D33-CM | SAMA5D34-CM | SAMA5D35-CM | SAMA5D36-CM |
|------------------------------|-------------|-------------|-------------|-------------|-------------|
| Embest/Flextronics           | X           |             | X           |             | X           |
| Ronetix                      | X           | X           | X           | X           |             |

The five CM boards share the same circuitry design with different designator information and PCB layouts. The circuitry reference in this guide, for common design parts, refers to schematics from SAMA5D3 series-CM (mfg2). All the other schematics are provided in the [Section 4.4 “Embest/Flextronics Schematics”](#) and [Section 4.5 “Ronetix Schematics”](#).

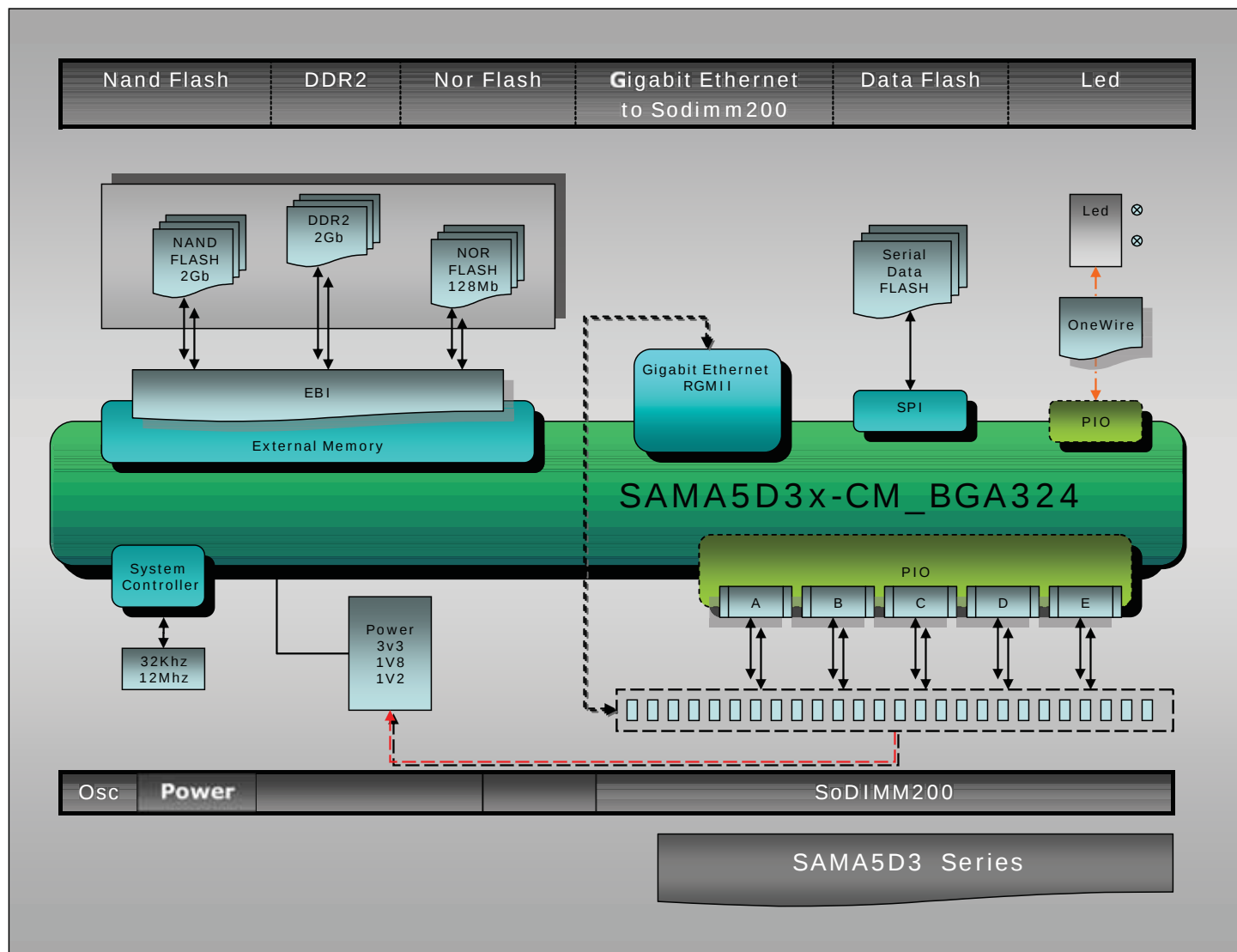
Figure 4-1. CPU Module Board from Embest/Flextronics



Figure 4-2. CPU Module Board from Ronetix



**Figure 4-3. Board Architecture**



Note: Different interfaces on the main board share the same connections to the CPU module. The actual usage depends on the CPU module featured in your evaluation kit.

## 4.2 Equipment List

The CM board is built around an ARM® Cortex®-A5-based microcontroller (BGA 324 package) with external memory and Gigabit Ethernet PHYsical layer transceiver.

### 4.2.1 Devices

Table 4-2. CPU Module Specifications

| Characteristic                             | Specifications                                                                                                                  |
|--------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------|
| PCB                                        | CPU Module (10 layers)                                                                                                          |
| Dimensions in mm:<br>(L x W x H)           | 67.60 *(40 to 47) * 5 max                                                                                                       |
| Processor                                  | SAMA5D31, SAMA5D33, SAMA5D34, SAMA5D35 and SAMA5D36 (324-ball BGA package)                                                      |
| Clock speed                                | 12 MHz crystal<br>32.768 kHz                                                                                                    |
| Memory                                     | 2 x DDR2 2 Gb 16 Meg x 16 x 8 banks<br>1 x SLC NAND Flash 2/4Gb 8-bit data<br>1 x NOR 128 Mb 16-bit data                        |
| On-board I/O Ports                         | One Serial EEPROM SPI<br>One 1-Wire EEPROM DS2431<br>One user-powered red LED and one user blue LED<br>One gigabit Ethernet PHY |
| Connector                                  | SODIMM200                                                                                                                       |
| Board supply voltage                       | 3.3V from SODIMM200 connector<br>On-board power regulation                                                                      |
| Temperature:<br>- operating<br>- storage   | 0°C to +60°C<br>-40°C to +85°C                                                                                                  |
| Relative humidity                          | 0 to 90% (non condensing)                                                                                                       |
| RoHS status                                | Compliant                                                                                                                       |
| Board Identification<br><br>Silkscreen top | SAMA5D31-CM<br>SAMA5D33-CM<br>SAMA5D34-CM<br>SAMA5D35-CM<br>SAMA5D36-CM                                                         |

### 4.2.2 Interface Connection

- SODIMM200 card edge interface

### 4.2.3 Configuration Items

- One jumper for SPI DataFlash chip select connection

## 4.2.4 Boot Options

Table 4-3 lists the supported boot options

**Table 4-3. Boot Options**

| Boot Mode | Boot Device       | Type                                                                                                                  | Note                                |
|-----------|-------------------|-----------------------------------------------------------------------------------------------------------------------|-------------------------------------|
| BMS OPEN  | Embedded ROM Boot | ROM Boot followed by:<br>- SPI0, NPCS0<br>- SD/MMC MCI0, MCI1<br>- NAND Flash<br>- SPI0, NPCS1<br>- TWI0<br>- SAM-BA® | Default boot is from embedded ROM   |
| BMS CLOSE | NOR Flash         | On-board NOR Flash using NCS0                                                                                         | Boot from external NOR Flash memory |

### 4.2.4.1 Boot Configuration

In order to use SAM-BA boot, the NAND Flash and SPI DataFlash must be deselected.

Pressing the pushbutton PB4 (CS boot disable) disconnects these two components from the system while the ROM Boot is searching for a boot device after reset. A reset can be forced by pressing the PB1 (NRST) pushbutton. Note that PB1 and PB4 pushbuttons are located on the main board (MB).

In order to boot from SAM-BA, both PB1 and PB4 should be pressed, then PB1 released while PB4 is kept pressed until SAM-BA boots.

## 4.3 Functional Blocks

### 4.3.1 Processor

The CM board is equipped with one Atmel SAMA5D3 ARM-based embedded MPU from the list below:

- SAMA5D31
- SAMA5D33
- SAMA5D34
- SAMA5D35
- SAMA5D36

The SAMA5D3x devices are packaged in a BGA324-ball BGA package and share an identical footprint.

.As different interfaces can be defined using the same pins, the functions available on the evaluation board depend on the actual configuration of the CPU.

The Atmel SAMA5D3 series is a high-performance, power-efficient embedded MPU based on the ARM Cortex-A5 processor, achieving 536 MHz with power consumption levels below 0.5 mW in low-power mode. The device features a floating point unit for high-precision computing and accelerated data processing, and a high data bandwidth architecture. It integrates advanced user interface and connectivity peripherals and security features.

The SAMA5D3 series features an internal multi-layer bus architecture associated with 39 DMA channels to sustain the high bandwidth required by the processor and the high-speed peripherals. The device offers support for DDR2/LPDDR/LPDDR2 and MLC NAND Flash memory with 24-bit ECC.

The comprehensive peripheral set includes an LCD controller with overlays for hardware-accelerated image composition, a touchscreen interface and a CMOS sensor interface. Connectivity peripherals include Gigabit EMAC with IEEE1588, 10/100 EMAC, multiple CAN, UART, SPI and I2C. With its secure boot mechanism, hardware accelerated engines for encryption (AES, TDES) and hash function (SHA), the SAMA5D3 ensures anti-cloning, code protection and secure external data transfers.

Refer to [Section 4. “CPU Module \(CM\) Board” on page 7](#) for details.

The processor runs at frequencies up to 536 MHz for the core and up to 166 MHz for the system bus.

### 4.3.2 Clock Circuitry

The CM board includes three clock sources:

- Two clocks are alternatives for the SAMA5D3 series processor main clock
- One crystal oscillator is used for the Ethernet RGMII chip

**Table 4-4. Main Components Associated with the Clock Systems**

| Quantity | Description                                 | Component Assignment |
|----------|---------------------------------------------|----------------------|
| 1        | Crystal for internal clock, 12 MHz          | Y1                   |
| 1        | Crystal for RTC clock, 32.768 kHz           | Y2                   |
| 1        | Oscillator for ethernet clock RGMII, 25 MHz | Y3                   |

### 4.3.3 Reset Circuitry

The reset sources for the CM board are:

- Power-on reset
- Pushbutton reset (Pushbutton is equipped on main board)
- JTAG reset from an in-circuit emulator (MB features an on-board JTAG interface)

#### 4.3.4 Power Supplies

The CM board is driven by +3.3V input power rail from the MB through the SODIMM200 connector. The CM board embeds all necessary power rails required for the microprocessor.

When additional voltages are required, they are generated on-board from the 3.3V supply (power source is a linear regulator or a switching regulator). The detailed power supply requirements for given modules are specified within the corresponding product documentation.

Table 4-5 summarizes the power specifications.

**Table 4-5. Supply Group Configuration**

| Nominal      | Name     | Powers                                                                                                  | Component                           |
|--------------|----------|---------------------------------------------------------------------------------------------------------|-------------------------------------|
| 3.0V         | VDDBU    | the Slow Clock oscillator, the internal 32K RC, the internal 12M RC and a part of the System Controller | From VBAT 3V, SODIMM200 connector   |
| 3.3V         | VDDIOP0  | a part of peripheral I/O lines                                                                          | From main 3.3V, SODIMM200 connector |
| 3.3V         | VDDIOP1  | a part of peripheral I/O lines                                                                          | From main 3.3V, SODIMM200 connector |
| 3.3V         | VDDUTMII | the USB device and host UTMI + interface                                                                | From main 3.3V, SODIMM200 connector |
| 3.3V         | VDDOSC   | the main oscillator cells                                                                               | From main 3.3V, SODIMM200 connector |
| 3.3V         | VDDANA   | the analog-to-digital converter                                                                         | From main 3.3V, SODIMM200 connector |
| 1.2V         | VDDCORE  | the core, including the processor, the embedded memories and the peripherals                            | Regulator on-board                  |
| 1.2V         | VDDUTMIC | the USB device and host UTMI + core                                                                     | Regulator on-board                  |
| 1.2V         | VDDPLLA  | the PLLA cell                                                                                           | Regulator on-board                  |
| 1.8V         | VDDIODDR | DDR2 interface I/O lines                                                                                | Regulator on-board                  |
| 1.8V         | VDDIOM   | NAND, NOR Flash and SMC interface I/O lines                                                             | Regulator on-board                  |
| 3.0V to 3.3V | ADVREF   | ADC reference voltage                                                                                   | From ADVREF, SODIMM200 connector    |
| 2.5V         | VDDFUSE  | Fuse box for programming                                                                                | Regulator on-board                  |

**Figure 4-4. Embest/Flextronics Power Supply**

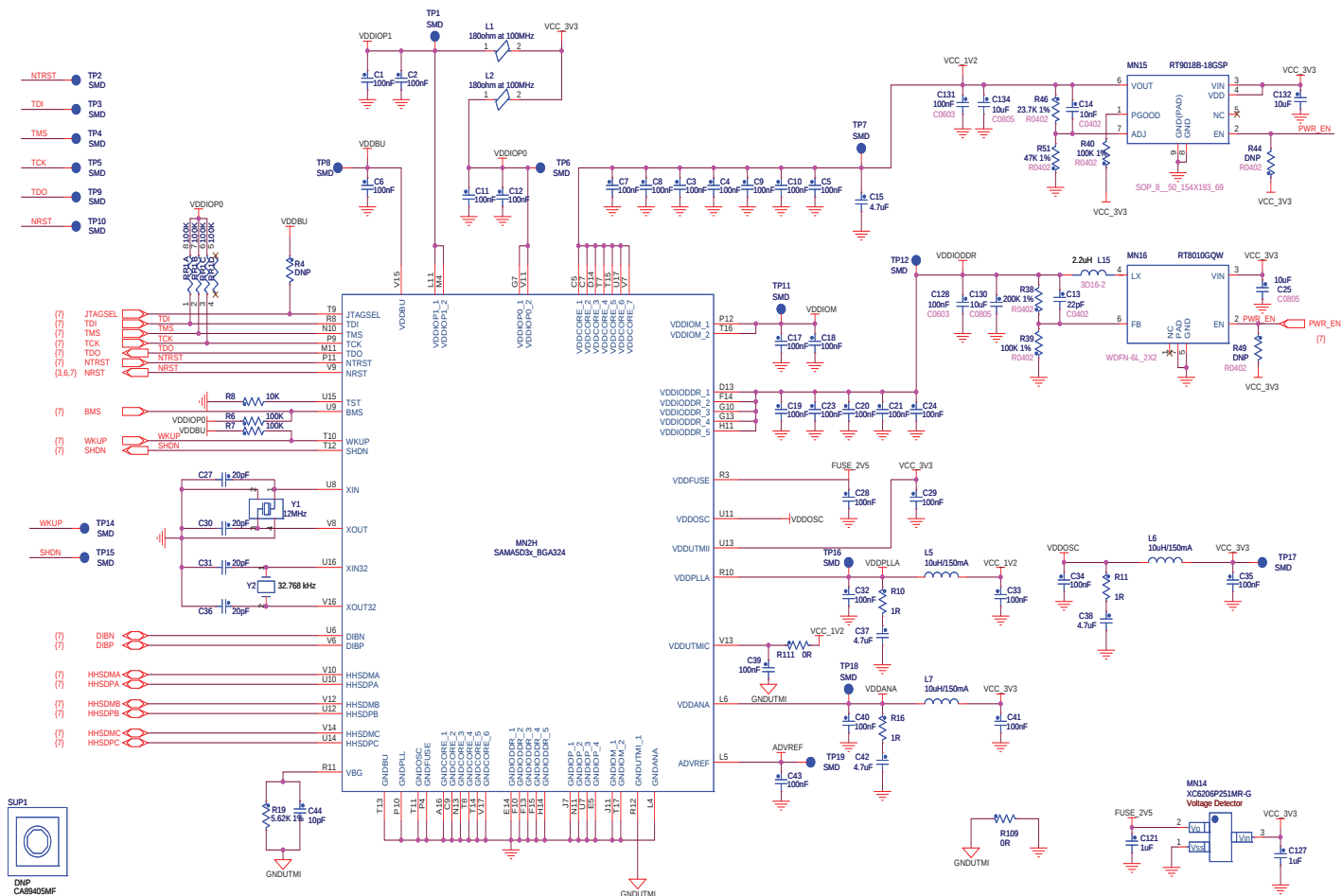


Figure 4-5. Ronetix Power Supply

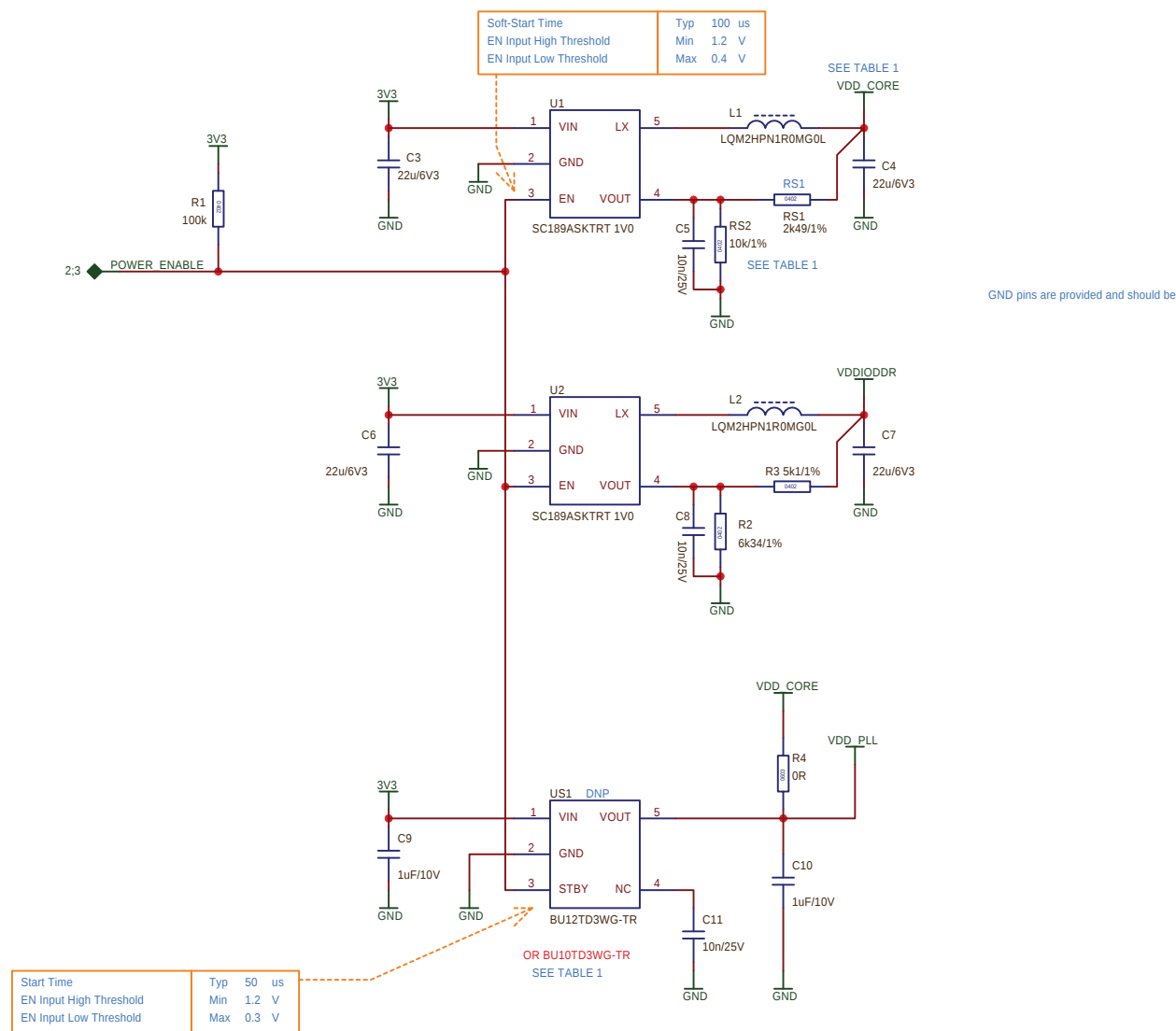
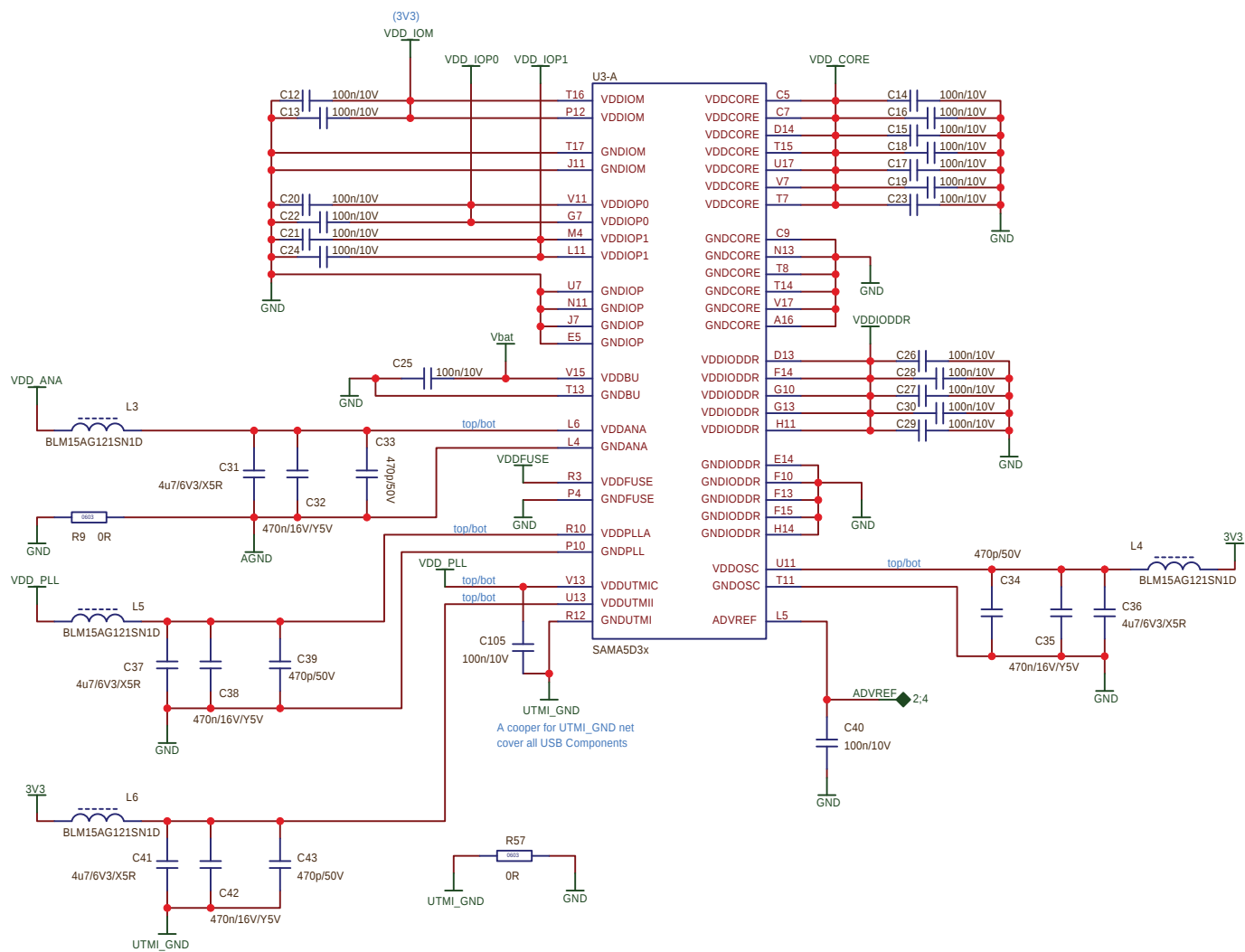


Figure 4-6. Ronetix Power Supply (Continued)



#### 4.3.5.1 Memory Organization

#### 4.3.5.2 Resource Allocation

- Two SDRAM/DDR2 are used as main system memory. MT47H128M16 - 2 Gb - 16 Meg x 16 x 8 banks, the board provides up to 2 Gb of on-board, soldered DDR2 SDRAM. The memory bus is 32 bits wide and operates at up to 166 MHz.

**Figure 4-7. Embest/Flextronics DDR2 Memory**

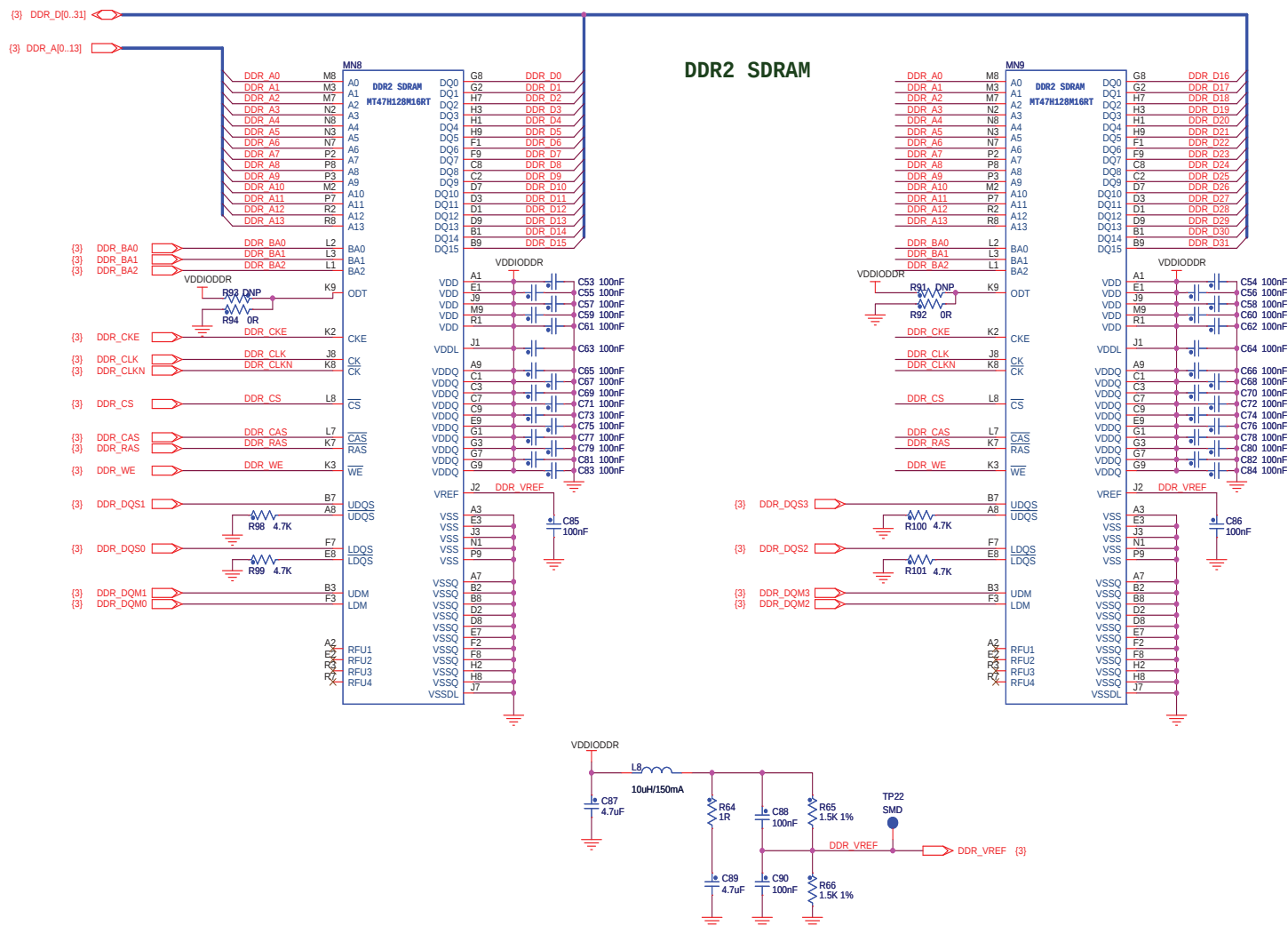
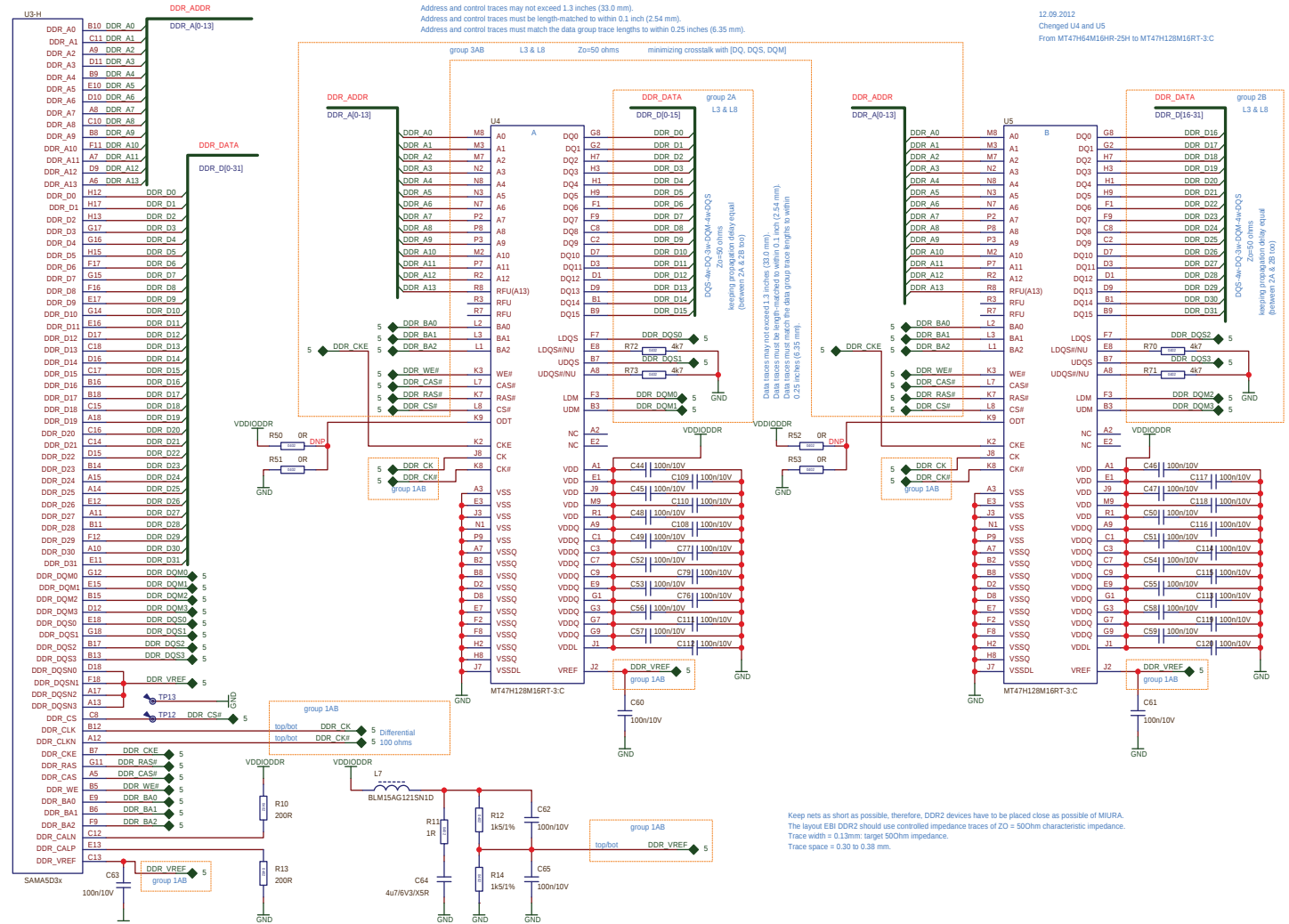
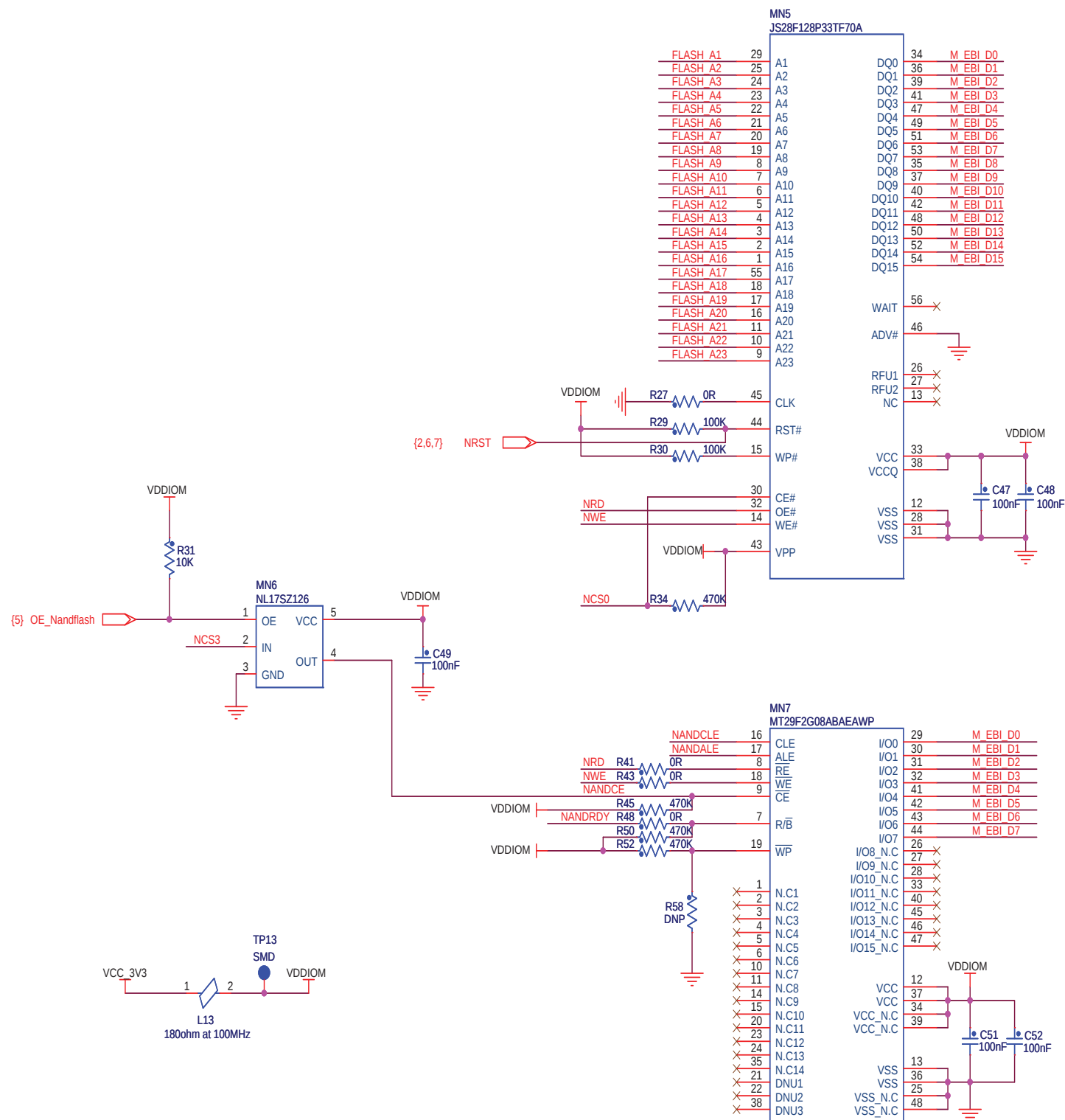


Figure 4-8. Ronetix DDR2 Memory

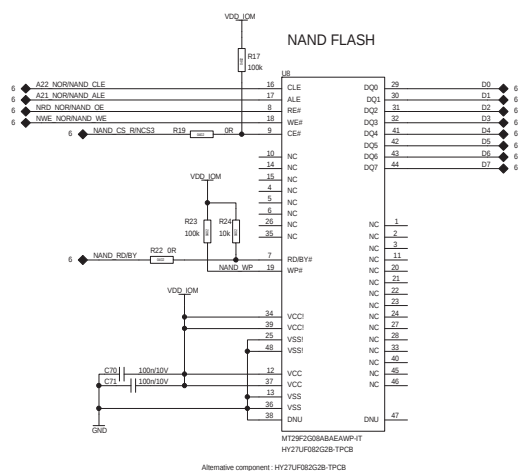
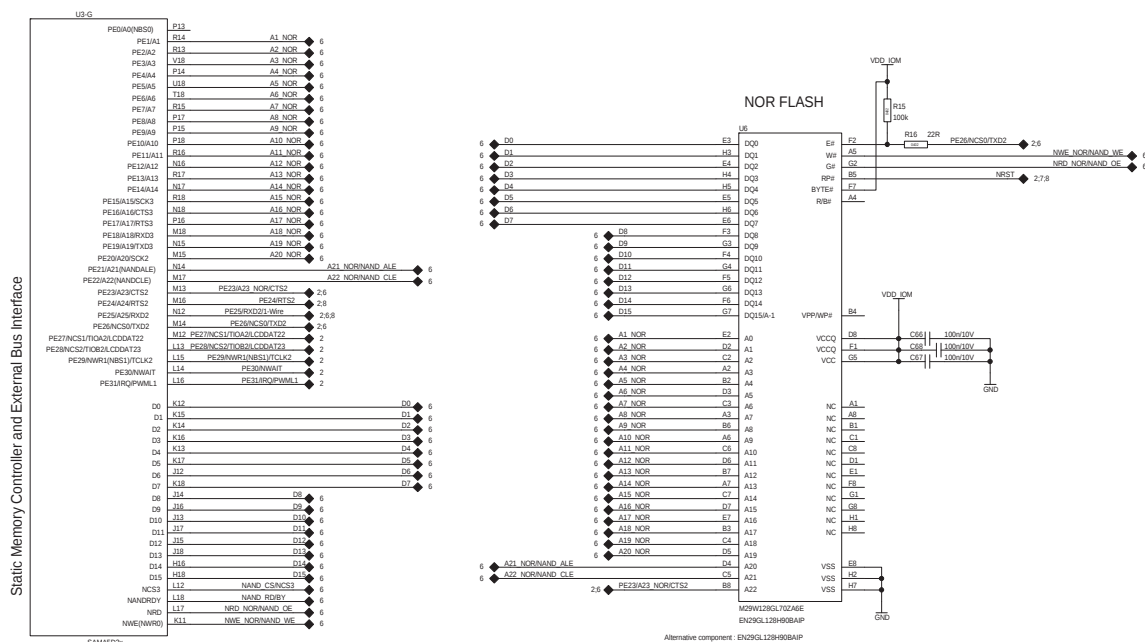


- One NAND Flash: NAND is connected to the processor. Maximum size is 256 bytes.
- One NOR Flash (optional, not populated): NOR Flash is 16 bits wide. Maximum size is 128 Mbytes.

Figure 4-9. Embest/Flextronics External Memory



**Figure 4-10. Ronetix External Memory**



### 4.3.6 Serial Peripheral Interface Controller (SPI)

The SAMA5D3 series processor provides two high-speed Serial Peripheral Interface (SPI) controllers. One port is used to interface with the on-board serial DataFlash. Note that the on-board serial DataFlash is enabled through a jumper: JP1 on Embest modules, J1 on Ronetix modules. The jumper must be in place access (and boot) the serial DataFlash.

Figure 4-11. Embest/Flextronics Serial DataFlash on SPI

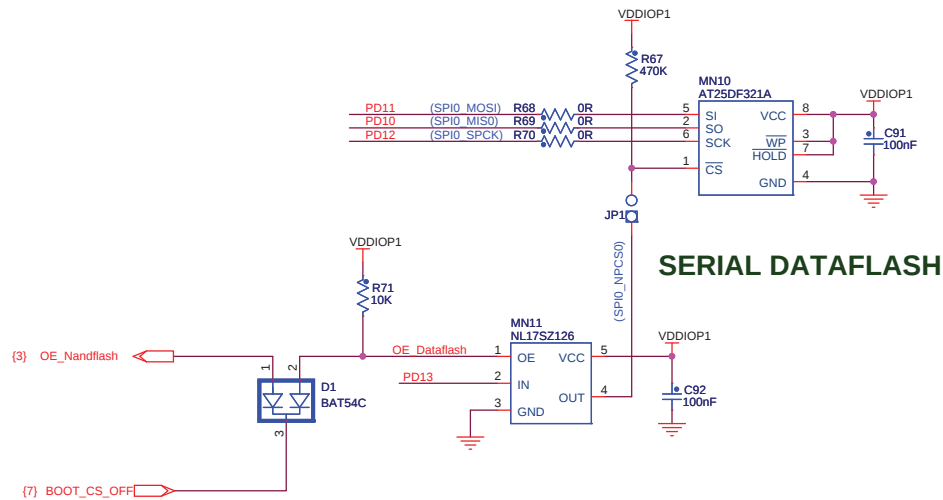
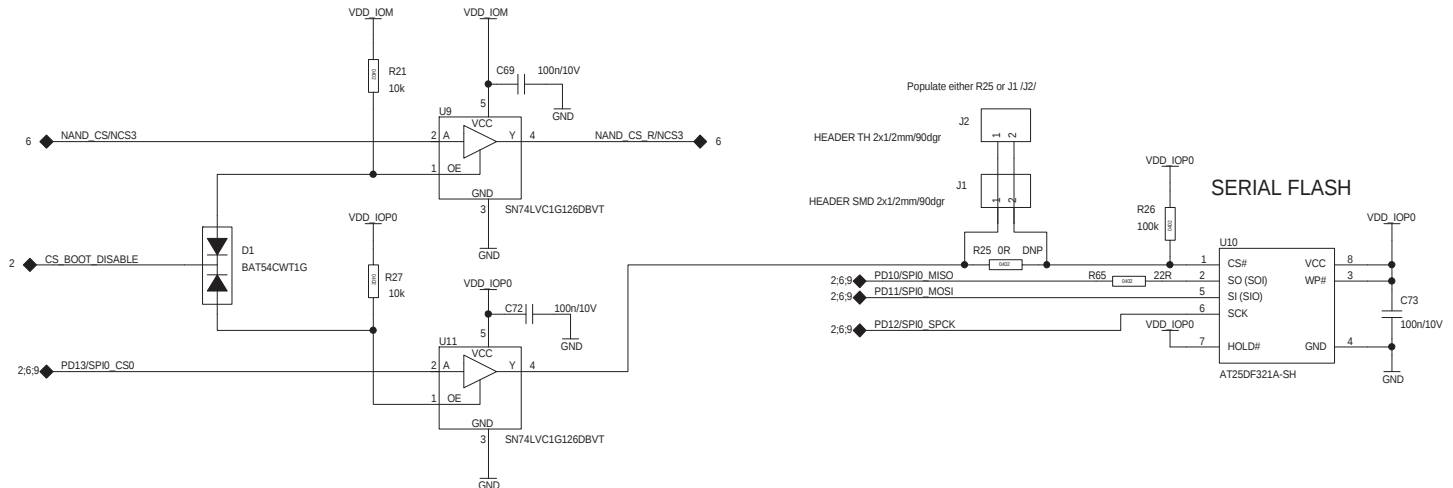


Figure 4-12. Ronetix Serial DataFlash on SPI



### 4.3.7 1-Wire EEPROM

The SAMA5D3 series CM board uses a 1-wire device as a “soft label” to store information such as chip type, manufacture name, production date, etc.

Only page 1 is used.

**Warning:** Do not modify the information contained in this page.

Pages 2 to n remain free for the user.

Figure 4-13. Embest 1-Wire EEPROM

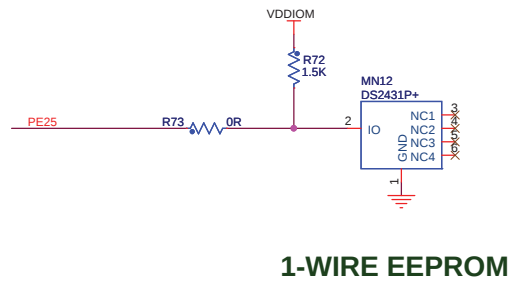
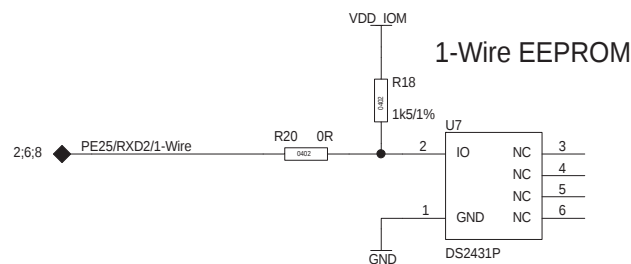


Figure 4-14. Ronetix 1-Wire EEPROM

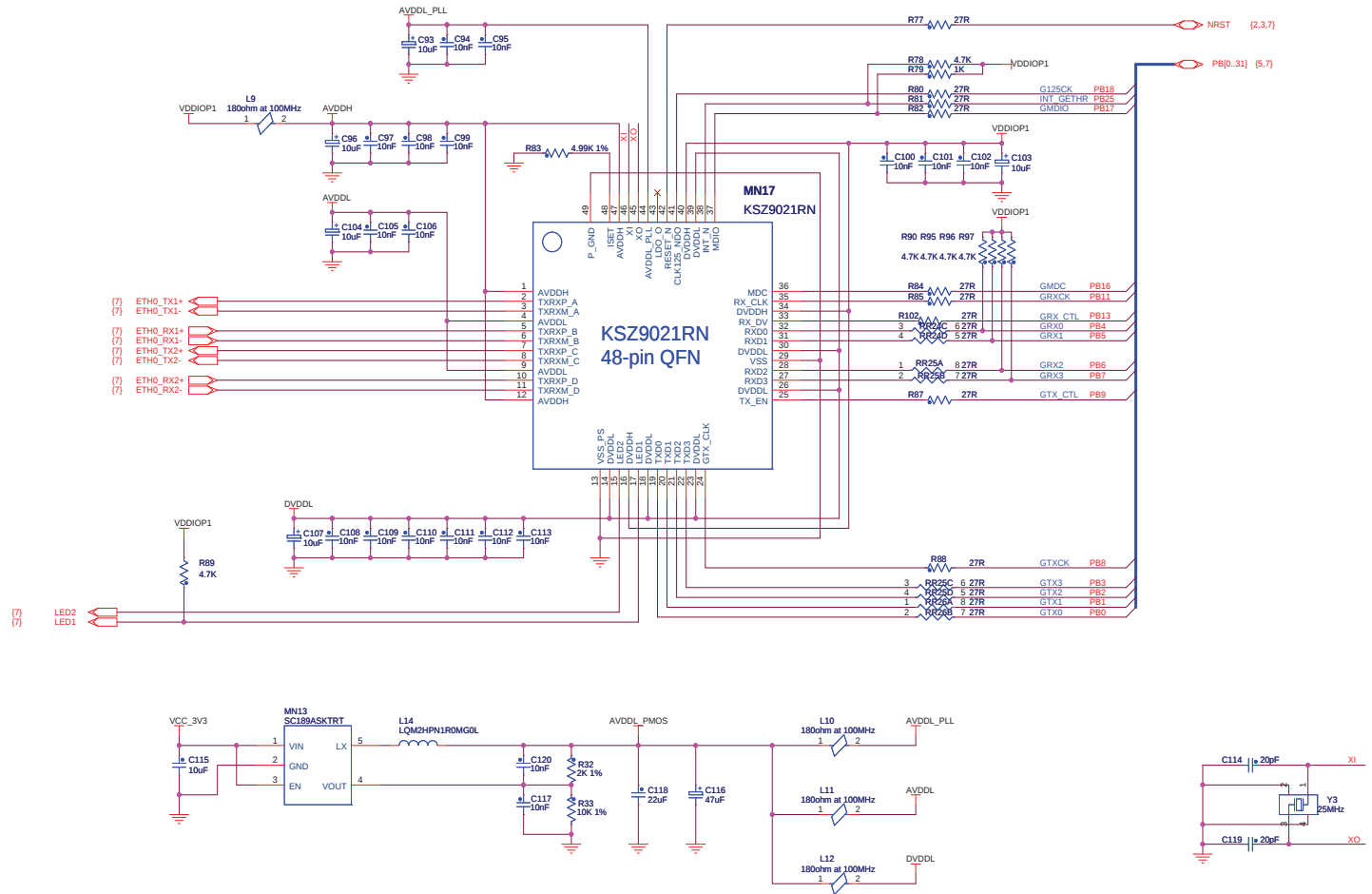


### 4.3.8 Tri-Speed Ethernet PHY

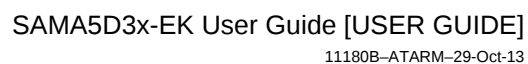
The SAMA5D3 series CM board is equipped with a MICREL PHY device (MICREL KSZ9021/31) operating at 10/100/1000 Mbps. The board supports the RGMII interface mode. The Ethernet interface consists of four pairs of low-voltage differential pair signals designated from GRX± and GTx± plus control signals for link activity indicators. These signals can be used to connect to a 10/100/1000 Base-T RJ45 connector integrated on the main board.

For more information about the Ethernet controller device, refer to the MICREL KSZ89021RN controller manufacturer's datasheet.

Figure 4-15. Embest/Flextronics GEthernet ETH0



Atmel



### 4.3.9 Indicators

There are two LEDs on the SAMA5D3 series CM board that can be controlled by the user. Both are controlled by GPIO lines PE24 and PE25 as shown below.

Figure 4-17. Embest/Flextronics LED Indicators

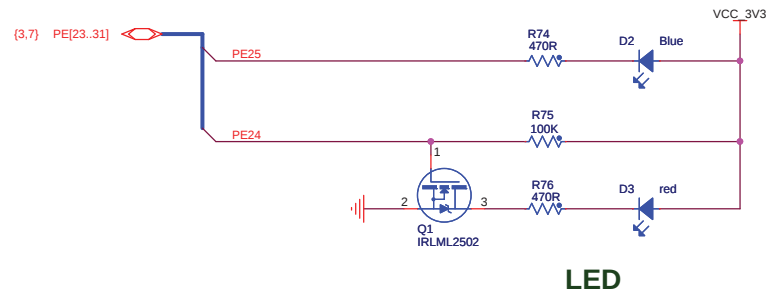
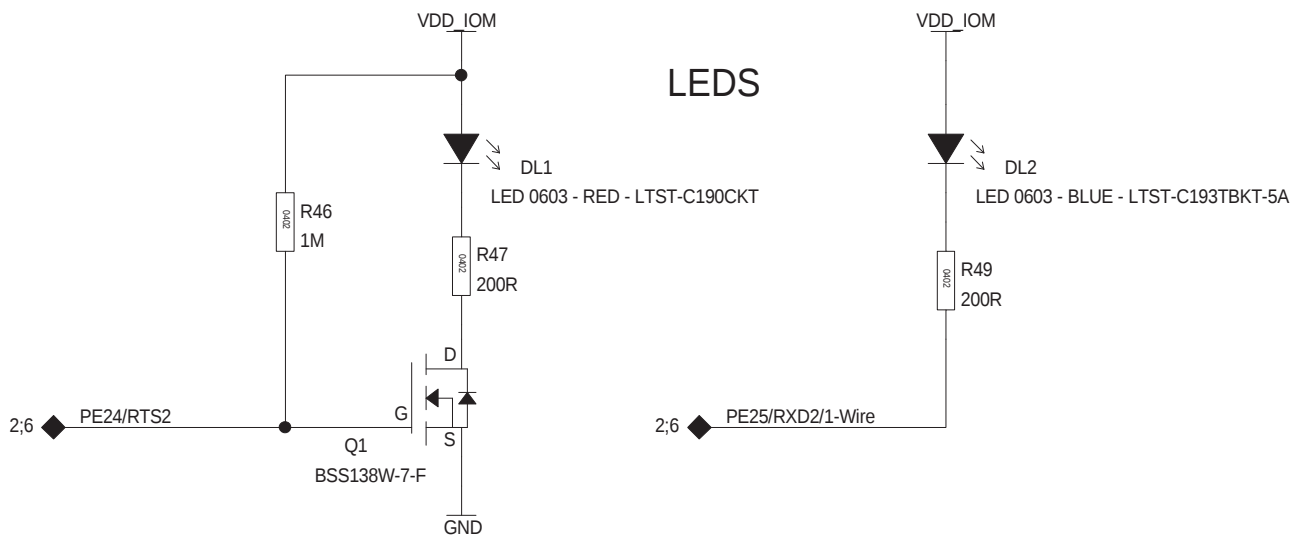


Figure 4-18. Ronetix LED Indicators



#### 4.3.10 SODIMM200 Interface

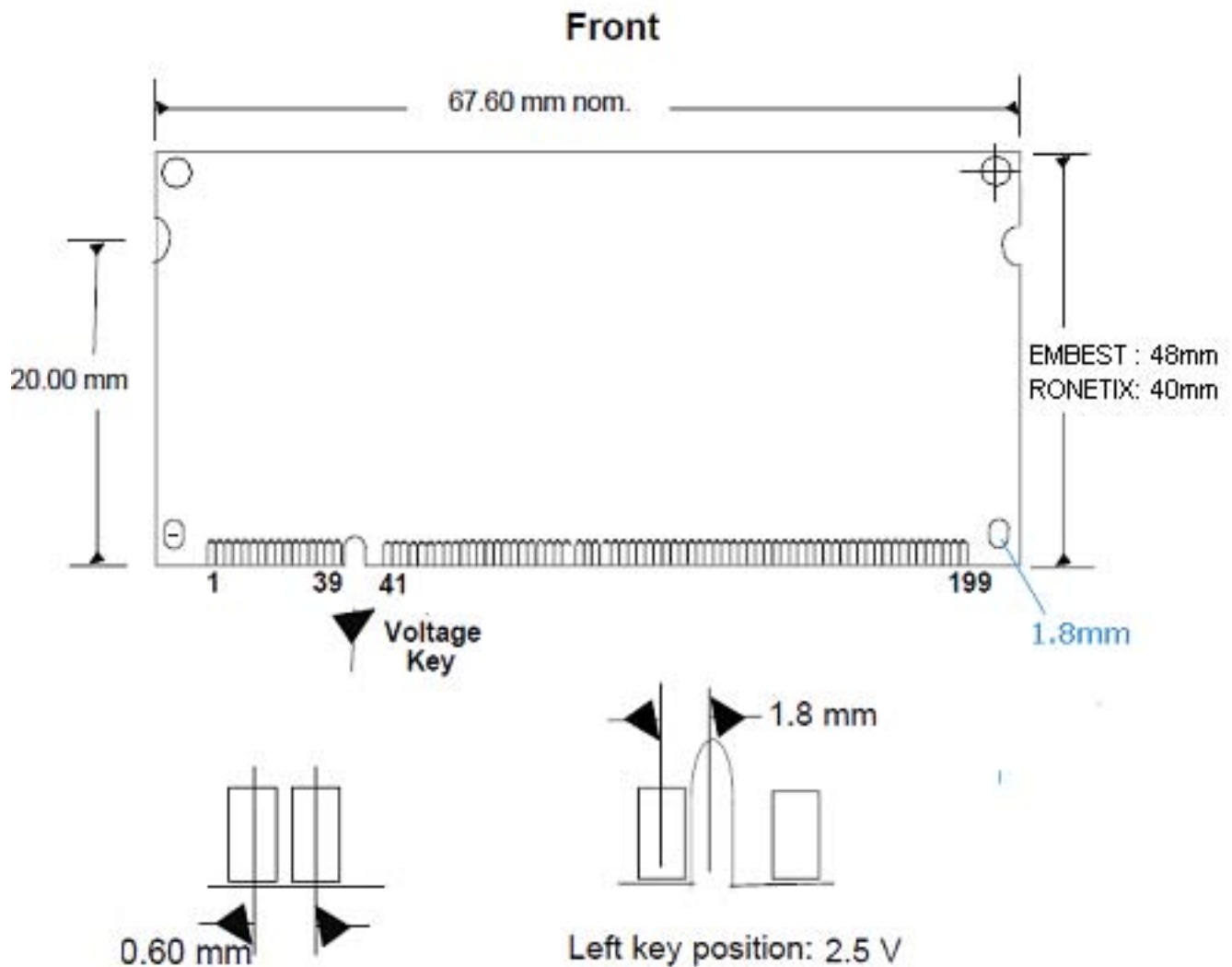
The SAMA5D3 series CM board uses SODIMM200 card edge connector to interface with the MB board.

Refer to [Section 5.4.22 “SODIMM Card Edge Socket”](#).

#### 4.3.11 Connectors

[Figure 4-19](#) shows the mechanical dimensions of the SAMA5D3 series CM board outline and the mounting holes.

Figure 4-19. CPU Module Board Dimensions



Holes for mounting screws on carrier board.

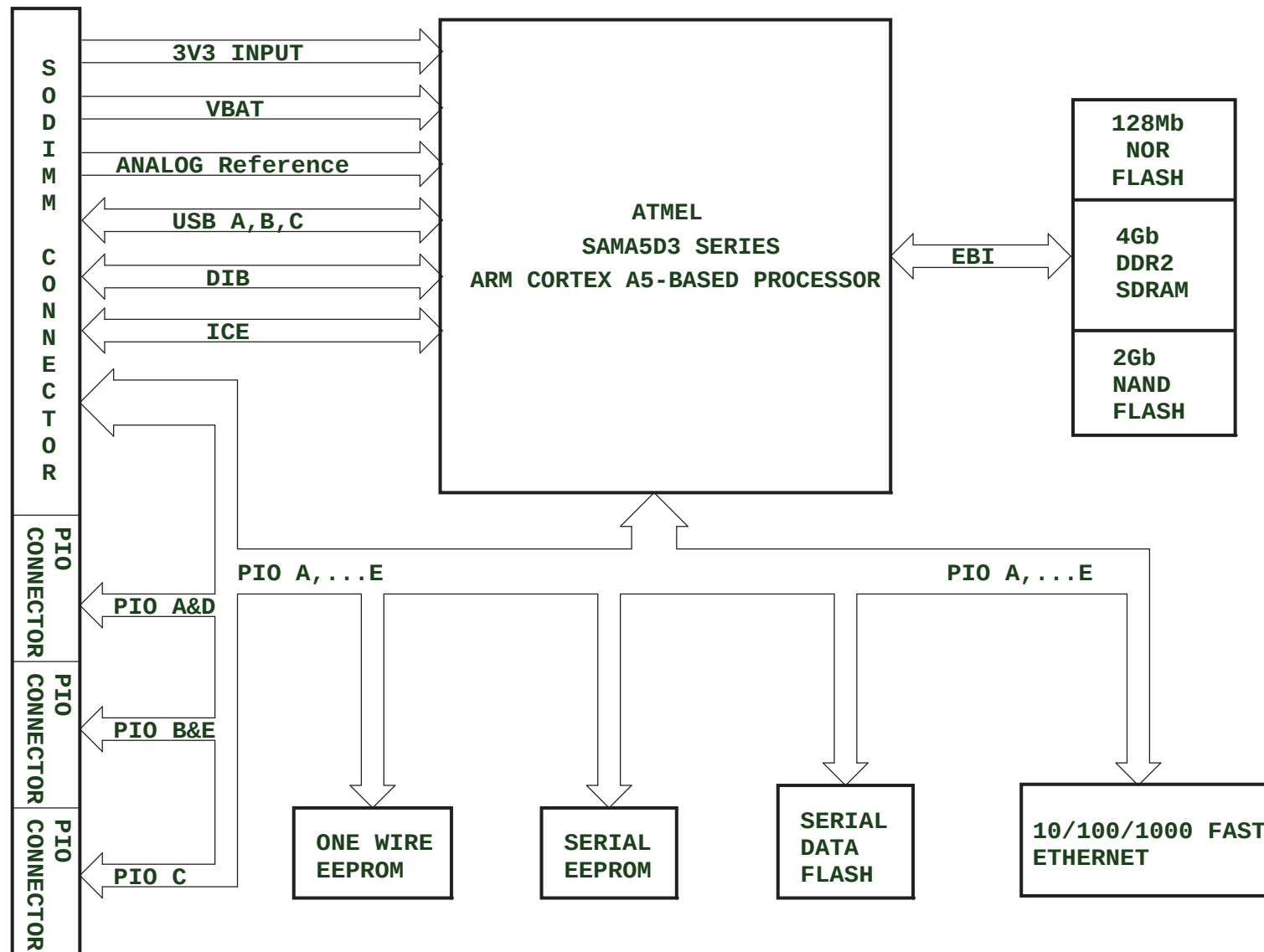
## 4.4 Embest/Flextronics Schematics

This SAMA5D3x-EK CM board manufactured by Embest/Flextronics is available in Revision D and Revision E. In this section, schematics are provided for both revisions.

### 4.4.1 CPU Module Revision D Schematics

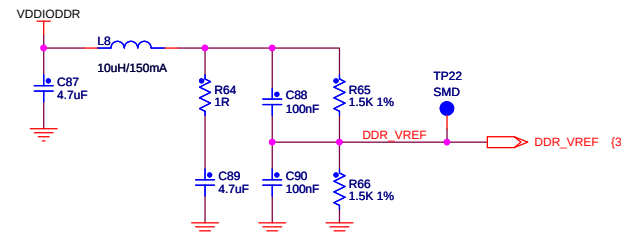
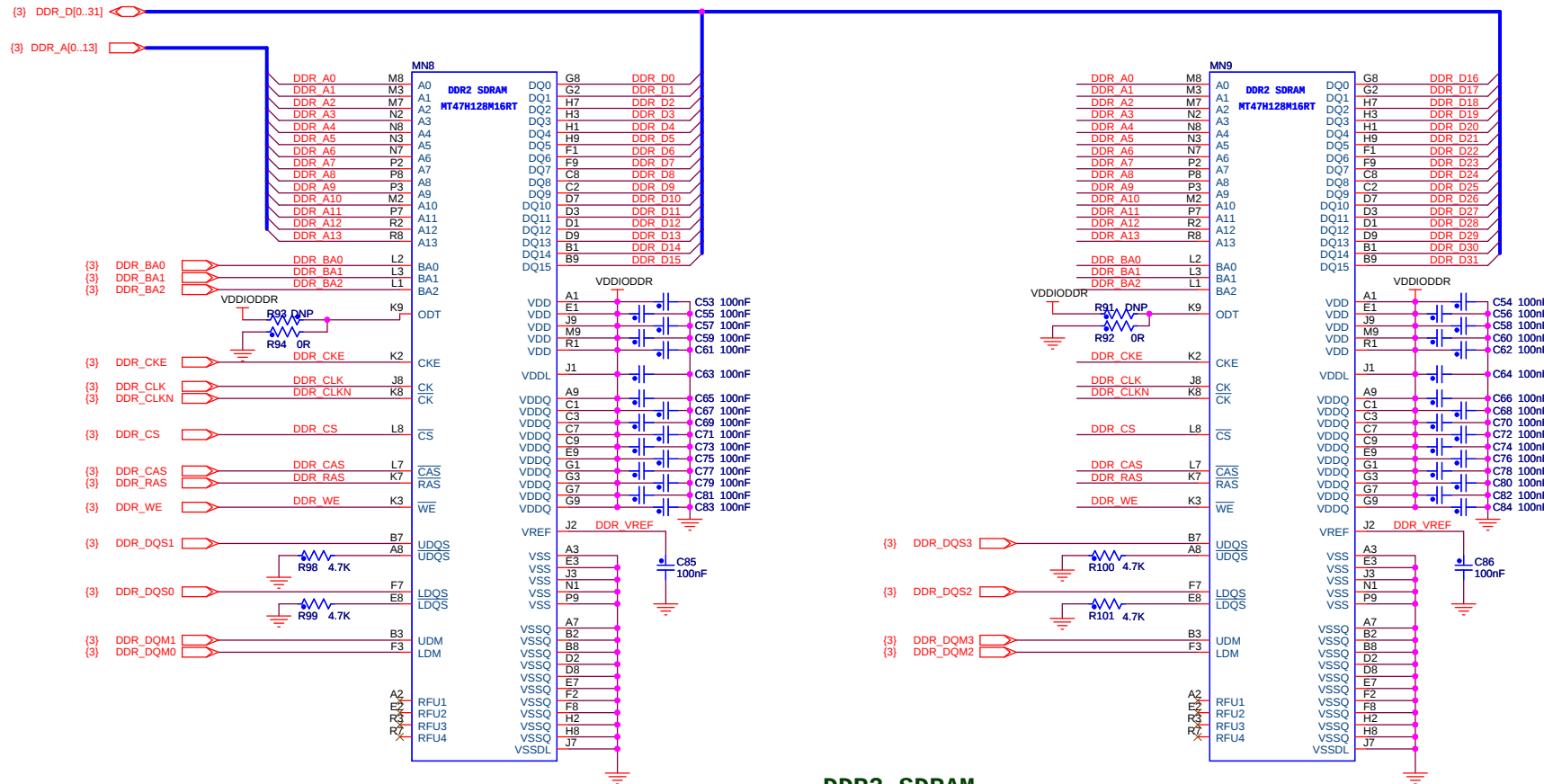
This section contains the following schematics:

- Block diagram
- SAMA5D3x power
- SAMA5D3x NOR and NAND
- 4 Gb DDR2
- SAMA5D3x DataFlash, 1-wire, LED
- Ethernet
- 200-pin SODIMM









MN2A  
SAMA5D3x BGA324

|               |     |      |
|---------------|-----|------|
| PA0_LCDDAT0   | E3  | PA0  |
| PA1_LCDDAT1   | F5  | PA1  |
| PA2_LCDDAT2   | D2  | PA2  |
| PA3_LCDDAT3   | F4  | PA3  |
| PA4_LCDDAT4   | D1  | PA4  |
| PA5_LCDDAT5   | J10 | PA5  |
| PA6_LCDDAT6   | G4  | PA6  |
| PA7_LCDDAT7   | J9  | PA7  |
| PA8_LCDDAT8   | F3  | PA8  |
| PA9_LCDDAT9   | J8  | PA9  |
| PA10_LCDDAT10 | E2  | PA10 |
| PA11_LCDDAT11 | K8  | PA11 |
| PA12_LCDDAT12 | F2  | PA12 |
| PA13_LCDDAT13 | G6  | PA13 |
| PA14_LCDDAT14 | E1  | PA14 |
| PA15_LCDDAT15 | H5  | PA15 |
| PA16_LCDDAT16 | H3  | PA16 |
| PA17_LCDDAT17 | H6  | PA17 |
| PA18_LCDDAT18 | H4  | PA18 |
| PA19_LCDDAT19 | H7  | PA19 |
| PA20_LCDDAT20 | H2  | PA20 |
| PA21_LCDDAT21 | J6  | PA21 |
| PA22_LCDDAT22 | G2  | PA22 |
| PA23_LCDDAT23 | J5  | PA23 |
| PA24_LCDDAT24 | F1  | PA24 |
| PA25_LCDDAT25 | J4  | PA25 |
| PA26_LCDDAT26 | G3  | PA26 |
| PA27_LCDDAT27 | J3  | PA27 |
| PA28_LCDDAT28 | G1  | PA28 |
| PA29_LCDDAT29 | K4  | PA29 |
| PA30_LCDDAT30 | H1  | PA30 |
| PA31_LCDDAT31 | K3  | PA31 |

PA[0..31] (7)

MN2C  
SAMA5D3x BGA324

|            |     |      |
|------------|-----|------|
| PC0_ETX0   | D8  | PC0  |
| PC1_ETX1   | A4  | PC1  |
| PC2_ERX0   | E8  | PC2  |
| PC3_ERX1   | A3  | PC3  |
| PC4_ETXEN  | A2  | PC4  |
| PC5_ECRSDV | F8  | PC5  |
| PC6_ERKER  | B3  | PC6  |
| PC7_EREFCK | G8  | PC7  |
| PC8_EMDIC  | B4  | PC8  |
| PC9_EMDIO  | F7  | PC9  |
| PC10       | D7  | PC10 |
| PC11       | C6  | PC11 |
| PC12       | E7  | PC12 |
| PC13       | B2  | PC13 |
| PC14       | F6  | PC14 |
| PC15       | B1  | PC15 |
| PC16       | E6  | PC16 |
| PC17       | C3  | PC17 |
| PC18       | D6  | PC18 |
| PC19       | C4  | PC19 |
| PC20       | D5  | PC20 |
| PC21       | G2  | PC21 |
| PC22       | C9  | PC22 |
| PC23       | C1  | PC23 |
| PC24       | H10 | PC24 |
| PC25       | H9  | PC25 |
| PC26       | D4  | PC26 |
| PC27       | H8  | PC27 |
| PC28       | G5  | PC28 |
| PC29       | D3  | PC29 |
| PC30       | E4  | PC30 |
| PC31       |     | PC31 |

PC[0..31] (7)

MN2B  
SAMA5D3x BGA324

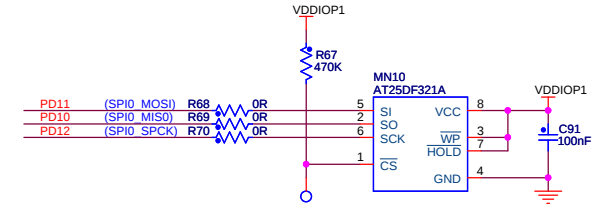
|             |     |      |
|-------------|-----|------|
| PB0_GTX0    | T2  | PB0  |
| PB1_GTX1    | N7  | PB1  |
| PB2_GTX2    | T3  | PB2  |
| PB3_GTX3    | N6  | PB3  |
| PB4_GRX0    | P5  | PB4  |
| PB5_GRX1    | T4  | PB5  |
| PB6_GRX2    | R4  | PB6  |
| PB7_GRX3    | U1  | PB7  |
| PB8_GTXCK   | R5  | PB8  |
| PB9_GTXEN   | P3  | PB9  |
| PB10_GTXER  | R6  | PB10 |
| PB11_GRXCK  | V3  | PB11 |
| PB12_GRXDV  | P6  | PB12 |
| PB13_GRXER  | V1  | PB13 |
| PB14_GCRS   | R7  | PB14 |
| PB15_GC0L   | U3  | PB15 |
| PB16_GMDC   | P7  | PB16 |
| PB17_GMDIO  | V2  | PB17 |
| PB18_G125CK | V5  | PB18 |
| PB19_GTX4   | T6  | PB19 |
| PB20_GTX5   | N8  | PB20 |
| PB21_GTX6   | U4  | PB21 |
| PB22_GTX7   | M7  | PB22 |
| PB23_GRX4   | U5  | PB23 |
| PB24_GRX5   | M8  | PB24 |
| PB25_GRX6   | T5  | PB25 |
| PB26_GRX7   | N9  | PB26 |
| PB27        | V4  | PB27 |
| PB28        | M9  | PB28 |
| PB29        | P8  | PB29 |
| PB30        | M10 | PB30 |
| PB31        | R9  | PB31 |

PB[0..31] (6,7)

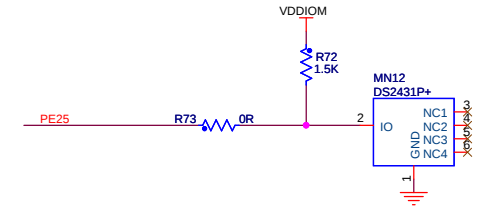
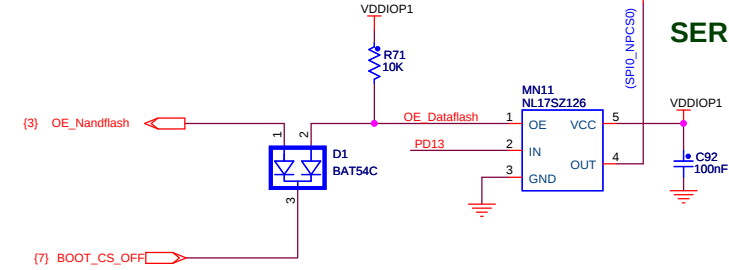
MN2D  
SAMA5D3x BGA324

|      |     |      |
|------|-----|------|
| PD0  | K5  | PD0  |
| PD1  | P1  | PD1  |
| PD2  | K6  | PD2  |
| PD3  | R1  | PD3  |
| PD4  | L7  | PD4  |
| PD5  | P2  | PD5  |
| PD6  | L8  | PD6  |
| PD7  | R2  | PD7  |
| PD8  | K7  | PD8  |
| PD9  | U2  | PD9  |
| PD10 | K9  | PD10 |
| PD11 | M5  | PD11 |
| PD12 | K10 | PD12 |
| PD13 | N4  | PD13 |
| PD14 | L9  | PD14 |
| PD15 | N3  | PD15 |
| PD16 | L10 | PD16 |
| PD17 | N5  | PD17 |
| PD18 | M6  | PD18 |
| PD19 | T1  | PD19 |
| PD20 | N2  | PD20 |
| PD21 | M3  | PD21 |
| PD22 | M2  | PD22 |
| PD23 | L3  | PD23 |
| PD24 | M1  | PD24 |
| PD25 | N1  | PD25 |
| PD26 | L1  | PD26 |
| PD27 | L2  | PD27 |
| PD28 | K1  | PD28 |
| PD29 | K2  | PD29 |
| PD30 | J1  | PD30 |
| PD31 | J2  | PD31 |

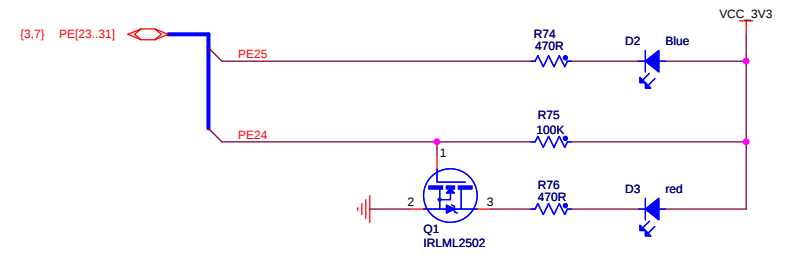
PD[0..31] (7)



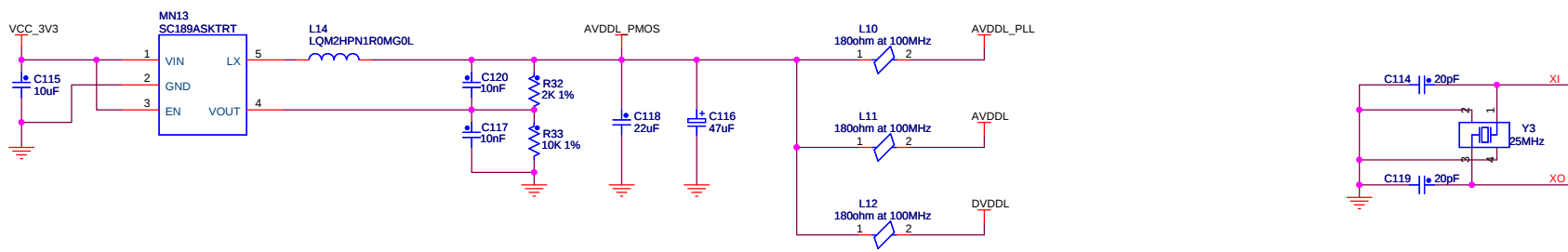
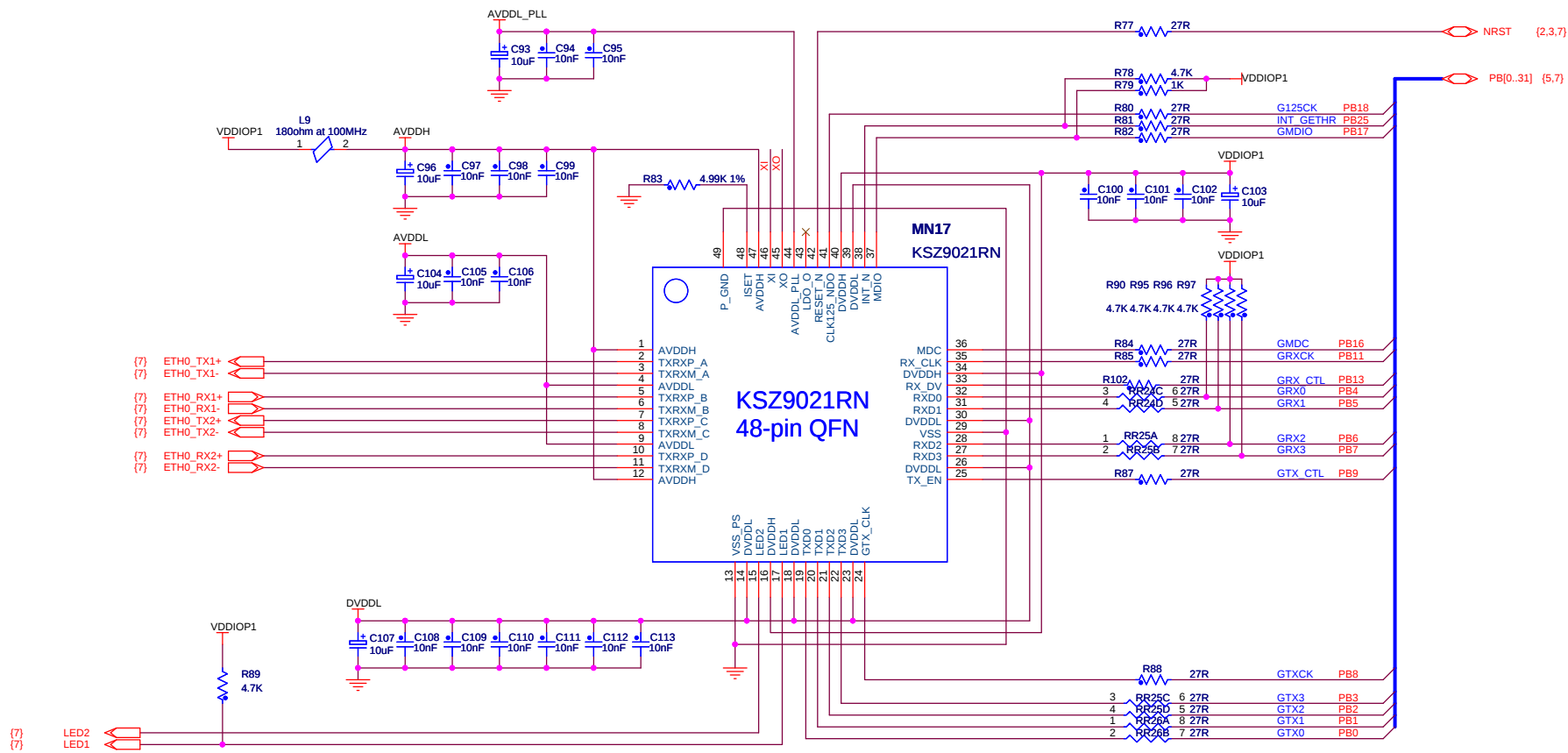
## SERIAL DATAFLASH

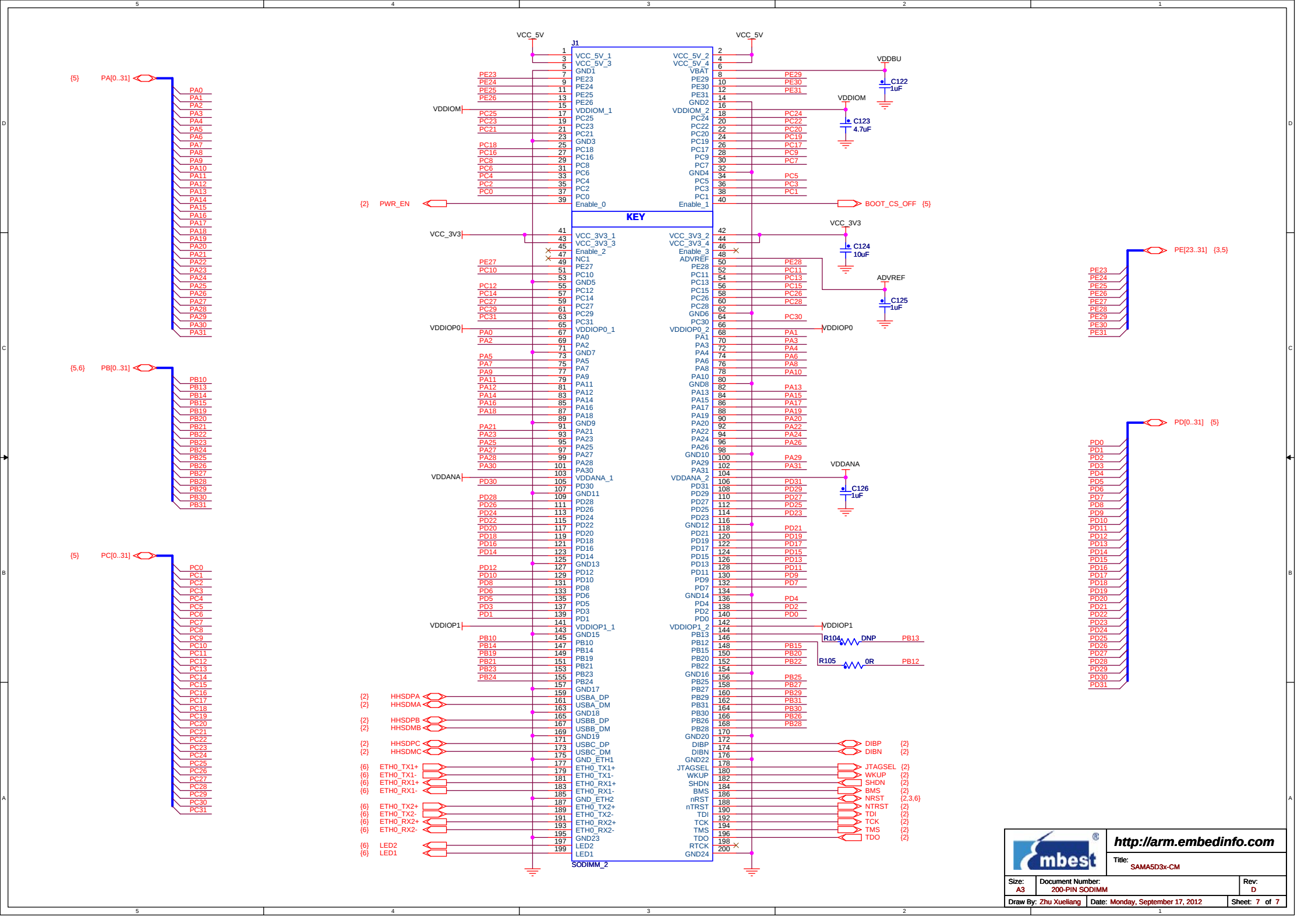


## 1-WIRE EEPROM



## LED

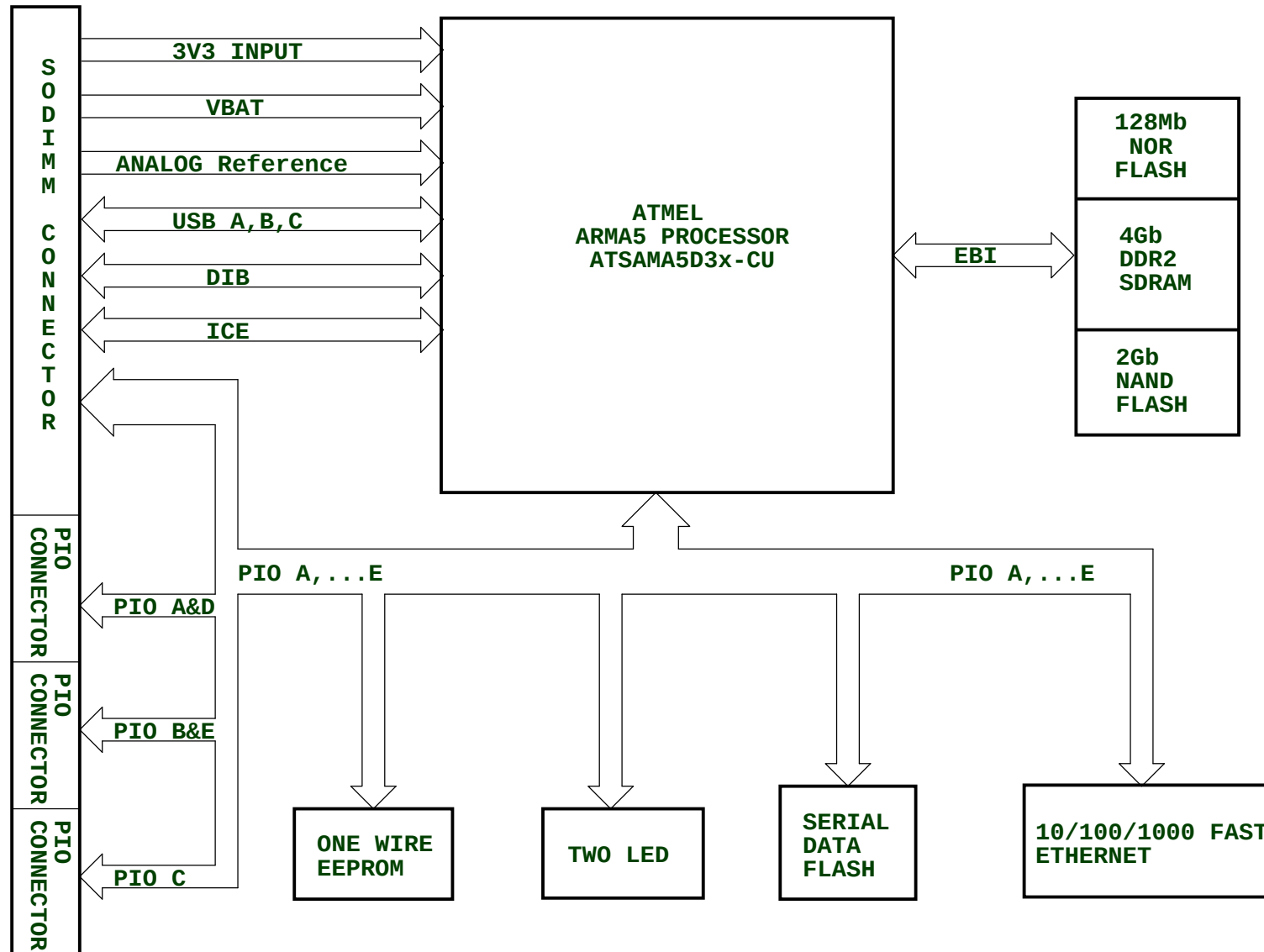




#### 4.4.2 CPU Module Revision E Schematics

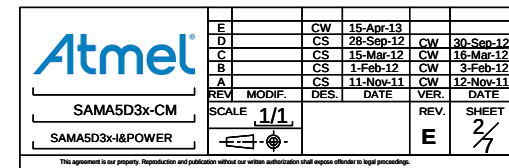
This section contains the following schematics:

- Main sheet
- SODIMM 200
- Power supply
- CPU power supply
- DDR2 interface
- FI: NAND, NOR, Serial, I2C, 1-wire
- Ethernet
- USB, JTAG, LEDs
- Bus interface



|                              |  |       |        |      |           |      |           |
|------------------------------|--|-------|--------|------|-----------|------|-----------|
|                              |  | REV   | MODIF. | DES. | DATE      | REV. | SHEET     |
|                              |  | E     |        | CW   | 15-Apr-13 |      |           |
|                              |  | D     |        | CS   | 28-Sep-12 | CW   | 30-Sep-12 |
|                              |  | C     |        | CS   | 15-Mar-12 | CW   | 16-Mar-12 |
| SAMA5D3x-CM<br>BLOCK DIAGRAM |  | B     |        | CS   | 1-Feb-12  | CW   | 3-Feb-12  |
|                              |  | A     |        | CS   | 11-Nov-11 | CW   | 12-Nov-11 |
|                              |  | SCALE | 1/1    |      |           | REV. | SHEET     |
|                              |  |       |        |      |           | E    | 1/1       |

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MN4A  
ATSAMA5D3x-CU

|               |     |      |
|---------------|-----|------|
| PA0_LCDDAT0   | E3  | PA0  |
| PA1_LCDDAT1   | F5  | PA1  |
| PA2_LCDDAT2   | D2  | PA2  |
| PA3_LCDDAT3   | F4  | PA3  |
| PA4_LCDDAT4   | D1  | PA4  |
| PA5_LCDDAT5   | J10 | PA5  |
| PA6_LCDDAT6   | G4  | PA6  |
| PA7_LCDDAT7   | J9  | PA7  |
| PA8_LCDDAT8   | F3  | PA8  |
| PA9_LCDDAT9   | J8  | PA9  |
| PA10_LCDDAT10 | E2  | PA10 |
| PA11_LCDDAT11 | K8  | PA11 |
| PA12_LCDDAT12 | F2  | PA12 |
| PA13_LCDDAT13 | G6  | PA13 |
| PA14_LCDDAT14 | E1  | PA14 |
| PA15_LCDDAT15 | H5  | PA15 |
| PA16_LCDDAT16 | H3  | PA16 |
| PA17_LCDDAT17 | H6  | PA17 |
| PA18_LCDDAT18 | H4  | PA18 |
| PA19_LCDDAT19 | H7  | PA19 |
| PA20_LCDDAT20 | H2  | PA20 |
| PA21_LCDDAT21 | J6  | PA21 |
| PA22_LCDDAT22 | G2  | PA22 |
| PA23_LCDDAT23 | J5  | PA23 |
| PA24_LCDDAT24 | F1  | PA24 |
| PA25_LCDDAT25 | J4  | PA25 |
| PA26_LCDDAT26 | G3  | PA26 |
| PA27_LCDDAT27 | J3  | PA27 |
| PA28_LCDDAT28 | G1  | PA28 |
| PA29_LCDDAT29 | K4  | PA29 |
| PA30_LCDDAT30 | H1  | PA30 |
| PA31_LCDDAT31 | K3  | PA31 |

MN4C  
ATSAMA5D3x-CU

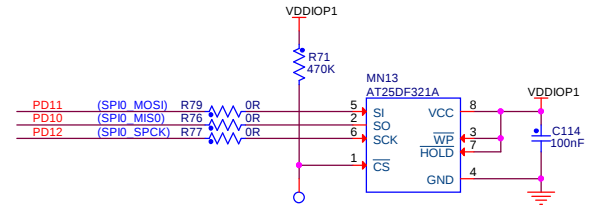
|            |     |      |
|------------|-----|------|
| PC0_ETX0   | D8  | PC0  |
| PC1_ETX1   | A4  | PC1  |
| PC2_ERX0   | E8  | PC2  |
| PC3_ERX1   | A3  | PC3  |
| PC4_ETXEN  | A2  | PC4  |
| PC5_ECRSDV | F8  | PC5  |
| PC6_ERKER  | B3  | PC6  |
| PC7_EREFCK | G8  | PC7  |
| PC8_EMDIC  | B4  | PC8  |
| PC9_EMDIO  | F7  | PC9  |
| PC10       | D7  | PC10 |
| PC11       | C6  | PC11 |
| PC12       | E7  | PC12 |
| PC13       | B2  | PC13 |
| PC14       | F6  | PC14 |
| PC15       | B1  | PC15 |
| PC16       | E6  | PC16 |
| PC17       | C3  | PC17 |
| PC18       | D6  | PC18 |
| PC19       | C4  | PC19 |
| PC20       | D5  | PC20 |
| PC21       | C2  | PC21 |
| PC22       | G9  | PC22 |
| PC23       | C1  | PC23 |
| PC24       | H10 | PC24 |
| PC25       | H9  | PC25 |
| PC26       | D4  | PC26 |
| PC27       | H8  | PC27 |
| PC28       | G5  | PC28 |
| PC29       | D3  | PC29 |
| PC30       | E4  | PC30 |
| PC31       |     | PC31 |

MN4B  
ATSAMA5D3x-CU

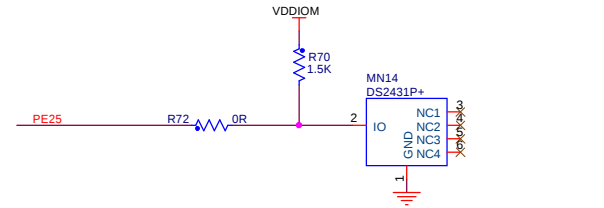
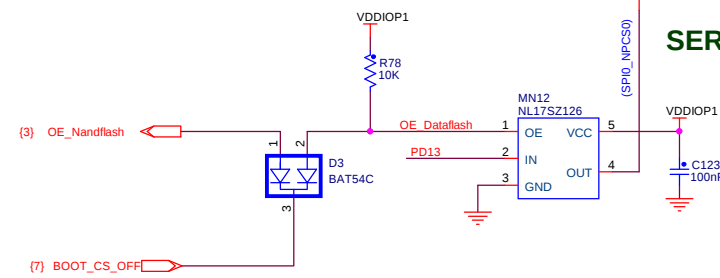
|             |     |      |
|-------------|-----|------|
| PB0_GTX0    | T2  | PB0  |
| PB1_GTX1    | N7  | PB1  |
| PB2_GTX2    | T3  | PB2  |
| PB3_GTX3    | N6  | PB3  |
| PB4_GRX0    | P5  | PB4  |
| PB5_GRX1    | T4  | PB5  |
| PB6_GRX2    | R4  | PB6  |
| PB7_GRX3    | U1  | PB7  |
| PB8_GTXCK   | R5  | PB8  |
| PB9_GTXEN   | P3  | PB9  |
| PB10_GTXER  | R6  | PB10 |
| PB11_GRXCK  | V3  | PB11 |
| PB12_GRXDV  | P6  | PB12 |
| PB13_GRXER  | V1  | PB13 |
| PB14_GCRS   | R7  | PB14 |
| PB15_GCOL   | U3  | PB15 |
| PB16_GMDC   | P7  | PB16 |
| PB17_GMDIO  | V2  | PB17 |
| PB18_G125CK | V5  | PB18 |
| PB19_GTX4   | T6  | PB19 |
| PB20_GTX5   | N8  | PB20 |
| PB21_GTX6   | U4  | PB21 |
| PB22_GTX7   | M7  | PB22 |
| PB23_GRX4   | U5  | PB23 |
| PB24_GRX5   | M8  | PB24 |
| PB25_GRX6   | T5  | PB25 |
| PB26_GRX7   | N9  | PB26 |
| PB27        | V4  | PB27 |
| PB28        | M9  | PB28 |
| PB29        | P8  | PB29 |
| PB30        | M10 | PB30 |
| PB31        | R9  | PB31 |

MN4D  
ATSAMA5D3x-CU

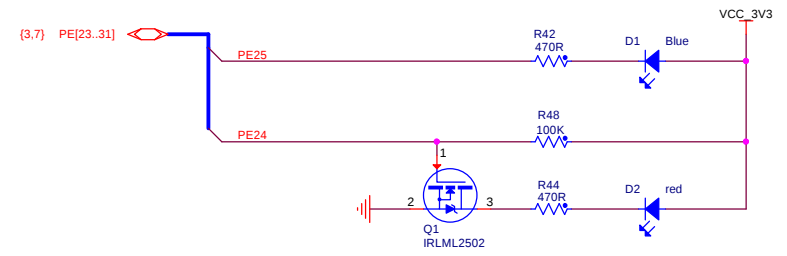
|      |     |      |
|------|-----|------|
| PD0  | K5  | PD0  |
| PD1  | P1  | PD1  |
| PD2  | K6  | PD2  |
| PD3  | R1  | PD3  |
| PD4  | L7  | PD4  |
| PD5  | P2  | PD5  |
| PD6  | L8  | PD6  |
| PD7  | R2  | PD7  |
| PD8  | K7  | PD8  |
| PD9  | U2  | PD9  |
| PD10 | K9  | PD10 |
| PD11 | M5  | PD11 |
| PD12 | K10 | PD12 |
| PD13 | N4  | PD13 |
| PD14 | L9  | PD14 |
| PD15 | N3  | PD15 |
| PD16 | L10 | PD16 |
| PD17 | N5  | PD17 |
| PD18 | M6  | PD18 |
| PD19 | T1  | PD19 |
| PD20 | N2  | PD20 |
| PD21 | M3  | PD21 |
| PD22 | M2  | PD22 |
| PD23 | L3  | PD23 |
| PD24 | M1  | PD24 |
| PD25 | N1  | PD25 |
| PD26 | L1  | PD26 |
| PD27 | L2  | PD27 |
| PD28 | K1  | PD28 |
| PD29 | K2  | PD29 |
| PD30 | J1  | PD30 |
| PD31 | J2  | PD31 |



## SERIAL DATAFLASH



## 1-WIRE EEPROM

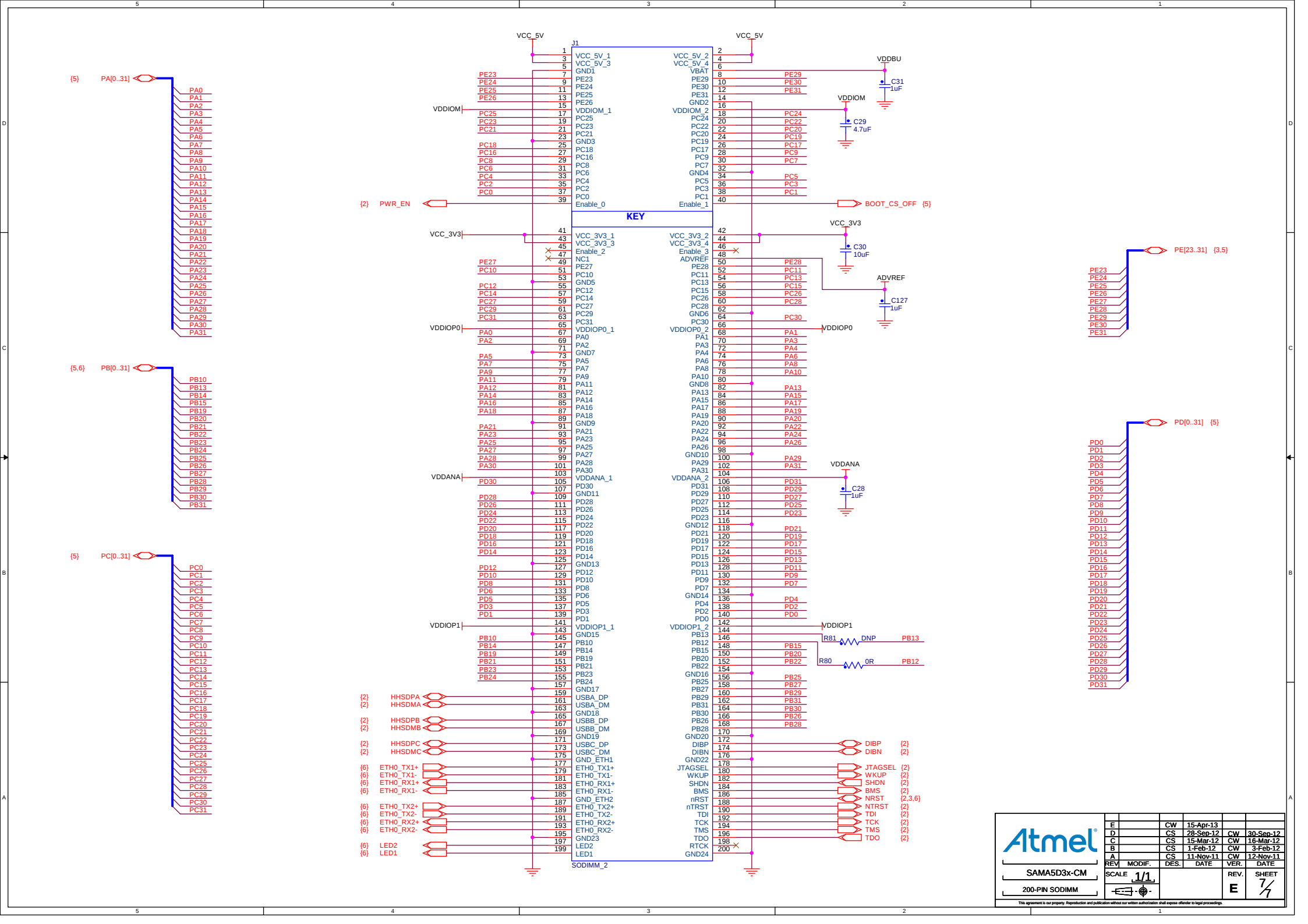


## LED

|                                   |  |       |        |      |           |      |           |
|-----------------------------------|--|-------|--------|------|-----------|------|-----------|
| Atmel                             |  | E     |        | CW   | 15-Apr-13 |      |           |
|                                   |  | D     |        | CS   | 28-Sep-12 | CW   | 30-Sep-12 |
|                                   |  | C     |        | CS   | 15-Mar-12 | CW   | 16-Mar-12 |
|                                   |  | B     |        | CS   | 1-Feb-12  | CW   | 3-Feb-12  |
|                                   |  | A     |        | CS   | 11-Nov-11 | CW   | 12-Nov-11 |
|                                   |  | REV   | MODIF. | DES. | DATE      | VER. | DATE      |
| SAMA5D3x-CM                       |  | SCALE | 1/1    |      |           | E    | 4/        |
| SAMA5D3x-III&DATAFLASH&1-WIRE&LED |  |       |        |      |           |      |           |







## 4.5 Ronetix Schematics

This section contains the schematics for the CM board manufactured by Ronetix:

- Main sheet
- SODIMM200
- Power supply
- CPU power supply
- DDR2 interface
- FI: NAND, NOR, Serial, I2C, 1-wire
- Ethernet
- USB, JTAG, LEDs
- Bus interface



## SCHEMATICS: SAMA5D3x-CM

| SHEET # | SHEET NAME                     |
|---------|--------------------------------|
| 1       | MAIN                           |
| 2       | SODIM200                       |
| 3       | POWER SUPPLY                   |
| 4       | CPU-POWER SUPPLY               |
| 5       | DDR2 INTERFACE                 |
| 6       | FI: NAND/NOR/SERIAL/I2C/1-WIRE |
| 7       | ETHERNET                       |
| 8       | USB/JTAG/LEDS                  |
| 9       | BUS INTERFACE                  |

| DATE:      | DESCRIPTION      | REVISION | STATUS |
|------------|------------------|----------|--------|
| 15.03.2012 | SAMA5D3x-CM v2.0 | 2.0      | OPEN   |
| 20.09.2012 | SAMA5D3x-CM v2.0 | 2.0      | CLOSE  |

### Changes Rev2.0

- SoDIMM200 change:
  - \* PB13 pin 144 with 0R DNP
  - \* PB12 pin 146 with 0R populated
- VDD\_CORE from 1.20V to 1.25V
- US1 - From TPS71712DCKR to BU12TD3WG-TR and attribute DNP
- Replaced Q2 with U15 SC189ASKTRT 1V0
- Q1 from BSS138W(SOT323) to BSS138(SOT23)
- C74 - from 47uF Tant to 22uF 0805
  - Added - C128 22uF 0805
  - C78 - from 47uF Tant to 22uF 0805
  - Added - C129 22uF 0805
  - C81 - from 47uF Tant to 22uF 0805
  - Added - C130 22uF 0805
  - C75 - from 47uF Tant to 22uF 0805
  - Added - C131 22uF 0805
  - C80 - from 47uF Tant to 22uF 0805
  - Added - C132 22uF 0805
  - C92 - from 10u Tant to 10u 0805
- R4 - Changed attribute Note from DNP to "empty"
- Y1 changed to CM200C-32.768KDZF-UT
- U6 changed to EN29GL128H-70BAIP
- U8 changed to HY27UF082G2B-TPCB

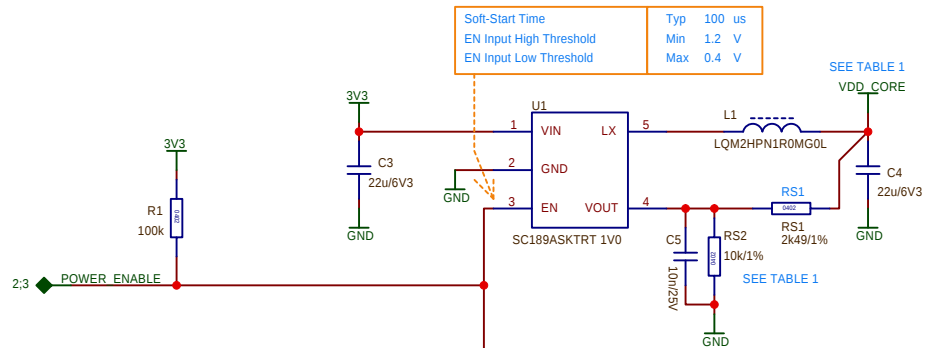
#### Mechanical

|                              |                             |
|------------------------------|-----------------------------|
| ○ Z6 Drill No plated 0.85mm  | ○ Z11 Passer 0.7 mm         |
| ○ Z7 Drill No plated 0.85mm  | ○ Z12 Passer 0.7 mm         |
| ○ Z5 Drill No plated 1.65mm  | ○ Z13 Passer 0.7 mm         |
| ○ Z8 Drill No plated 1.65mm  | ○ Z14 Passer 0.7 mm         |
| ○ Z9 Drill No plated 1.65mm  |                             |
| ○ Z10 Drill No plated 1.65mm |                             |
| ○ Z1 Drill No plated 1.8 mm  | ○ Z3 Drill No plated 3.2 mm |
| ○ Z2 Drill No plated 1.8 mm  | ○ Z4 Drill No plated 3.2 mm |

Note: To each Signal Reference have one or more digits.  
These are the numbers of sheets  
to which is connected this signal.

|               |  |  |  |  |                       |  |  |  |  |                                                                                                                             |  |  |  |  |           |  |  |  |  |                  |  |  |  |  |        |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|---------------|--|--|--|--|-----------------------|--|--|--|--|-----------------------------------------------------------------------------------------------------------------------------|--|--|--|--|-----------|--|--|--|--|------------------|--|--|--|--|--------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| PROJECT TITLE |  |  |  |  | SAMA5D3x-CM           |  |  |  |  | <br>development tool<br>www.ronetix.at |  |  |  |  |           |  |  |  |  |                  |  |  |  |  |        |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| SHEET TITLE   |  |  |  |  | MAIN                  |  |  |  |  |                                                                                                                             |  |  |  |  |           |  |  |  |  |                  |  |  |  |  |        |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| FILE          |  |  |  |  | SAMA5D3x-CM v2.0f.scm |  |  |  |  |                                                                                                                             |  |  |  |  | SHEET NO  |  |  |  |  | 1 OF 9           |  |  |  |  |        |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| SIZE          |  |  |  |  | REV                   |  |  |  |  |                                                                                                                             |  |  |  |  | DATE      |  |  |  |  | DESCRIPTION FILE |  |  |  |  | DROWN  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| A4            |  |  |  |  |                       |  |  |  |  |                                                                                                                             |  |  |  |  | 20.9.2012 |  |  |  |  |                  |  |  |  |  | ISSUED |  |  |  |  |  |  |  |  |  |  |  |  |  |  |





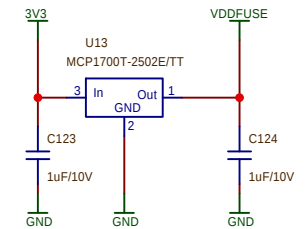
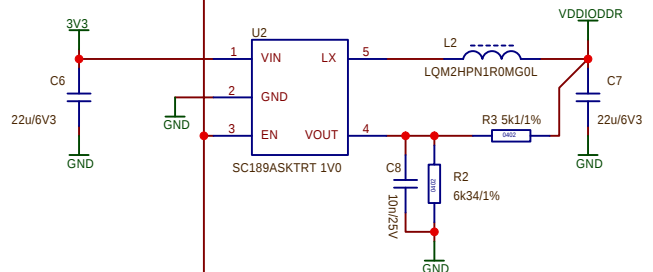
|                         |     |     |    |
|-------------------------|-----|-----|----|
| Soft-Start Time         | Typ | 100 | us |
| EN Input High Threshold | Min | 1.2 | V  |
| EN Input Low Threshold  | Max | 0.4 | V  |

SEE TABLE 1

TABLE 1  $RS1=(V_{out}-1) \times RS2$

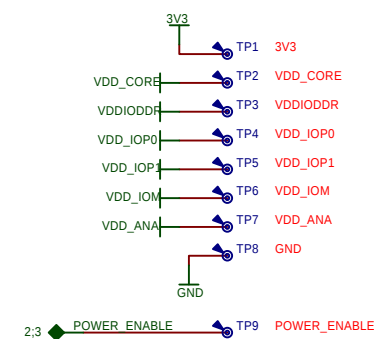
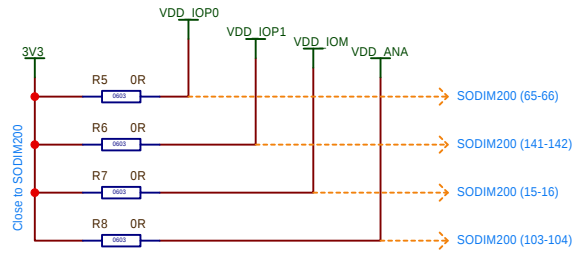
| VDD_CORE | 1.0V         | 1.2V         | 1.25V     |
|----------|--------------|--------------|-----------|
| RS1      | 0R (JUMP)    | 2kOhm 1%     | 2k5ohm 1% |
| RS2      | DNP          | 10kOhm 1%    | 10kOhm 1% |
| US1      | BU10TD3WG-TR | BU12TD3WG-TR |           |

2k49ohm 1%



|                         |     |     |    |
|-------------------------|-----|-----|----|
| Start Time              | Typ | 50  | us |
| EN Input High Threshold | Min | 1.2 | V  |
| EN Input Low Threshold  | Max | 0.3 | V  |

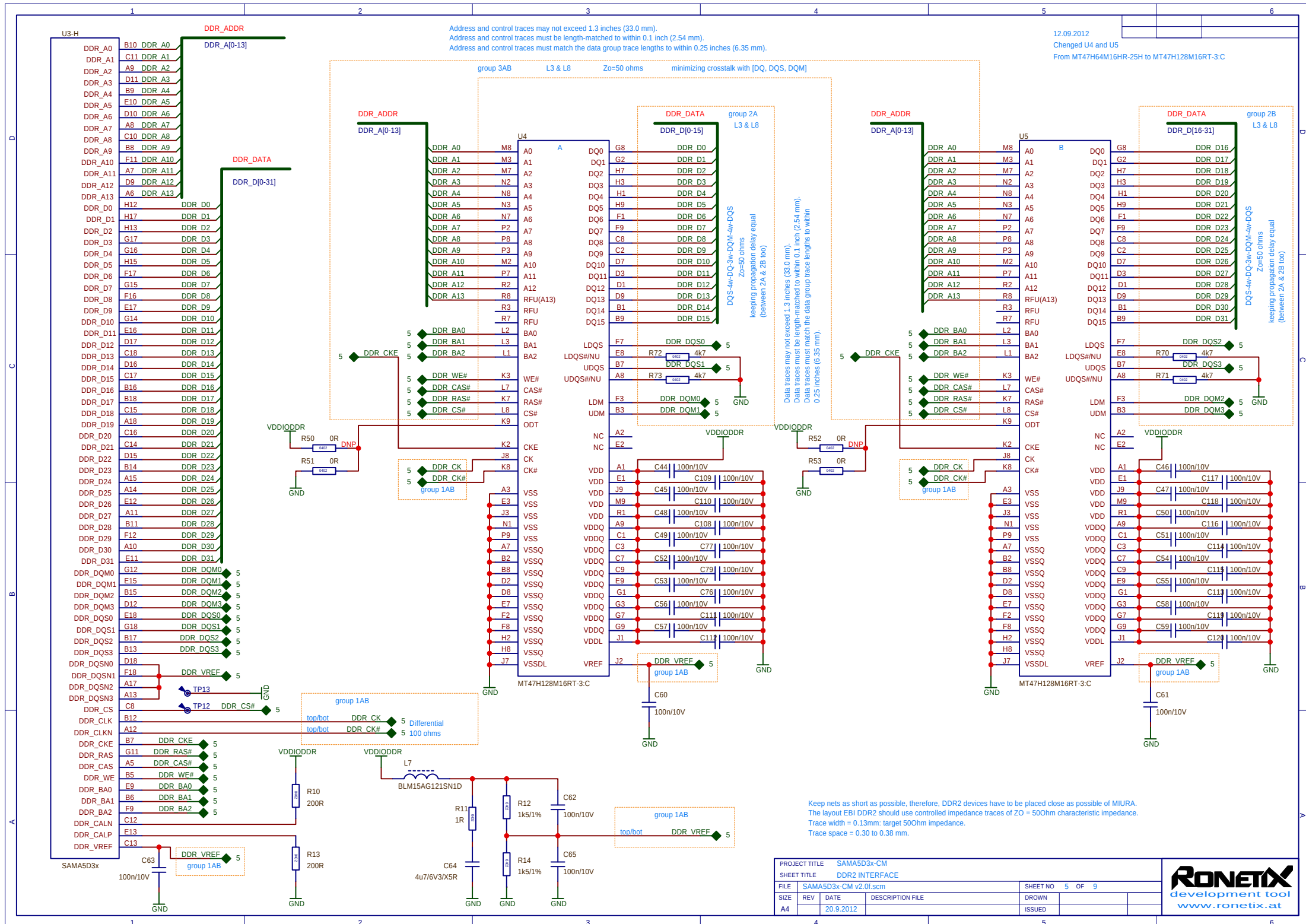
OR BU10TD3WG-TR  
SEE TABLE 1

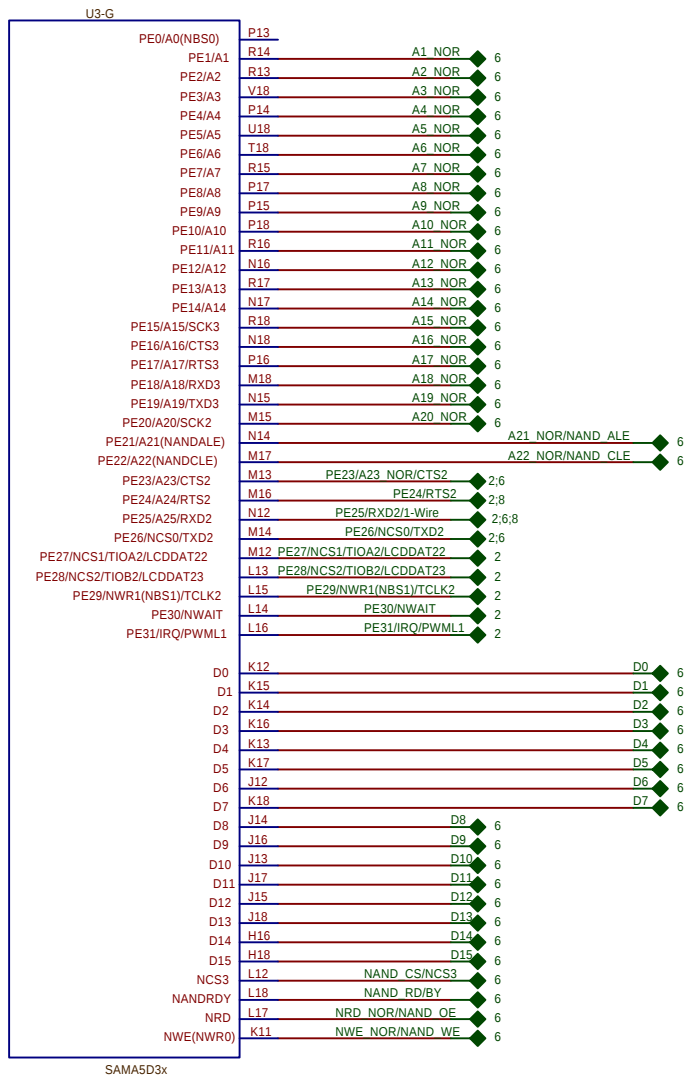


2,3 POWER ENABLE

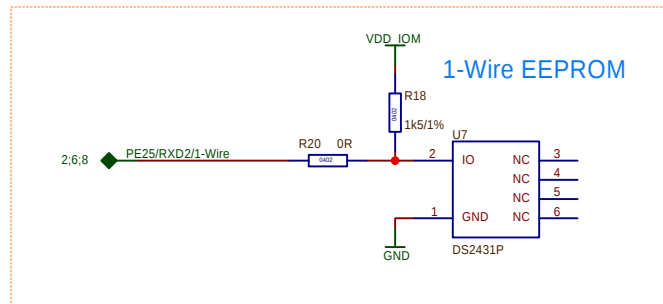
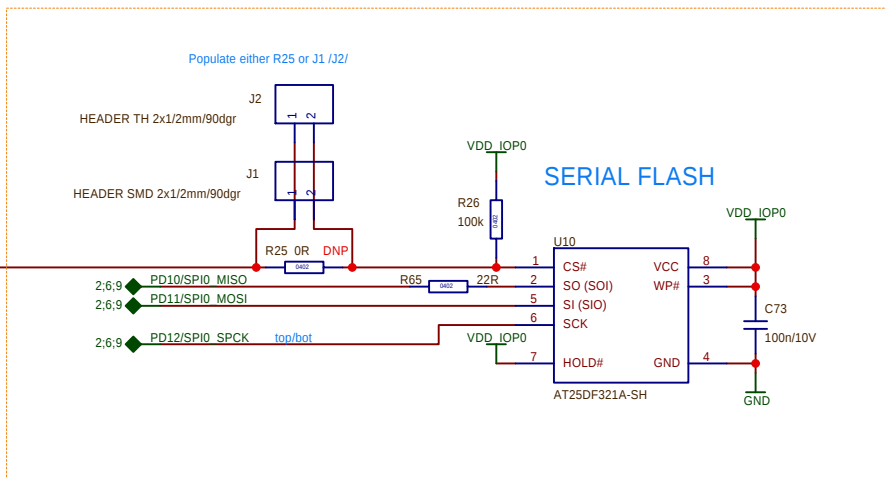
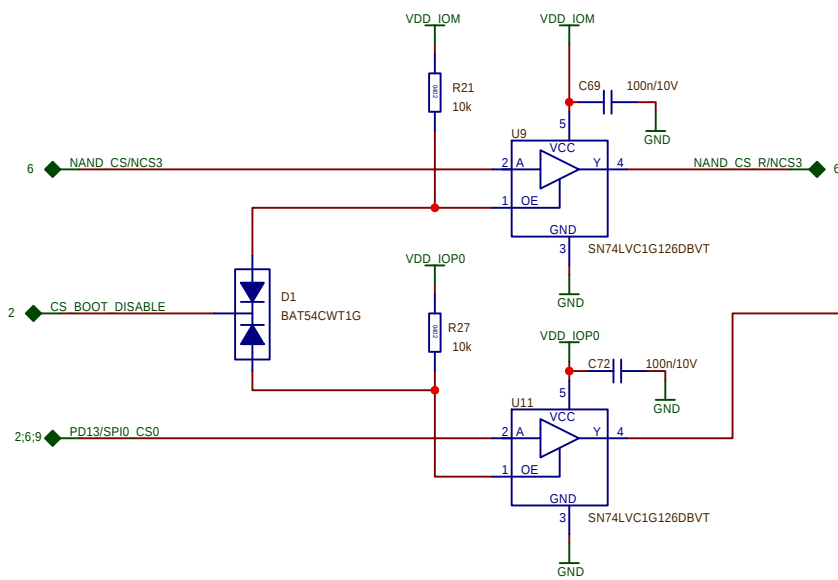
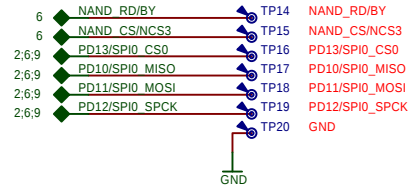
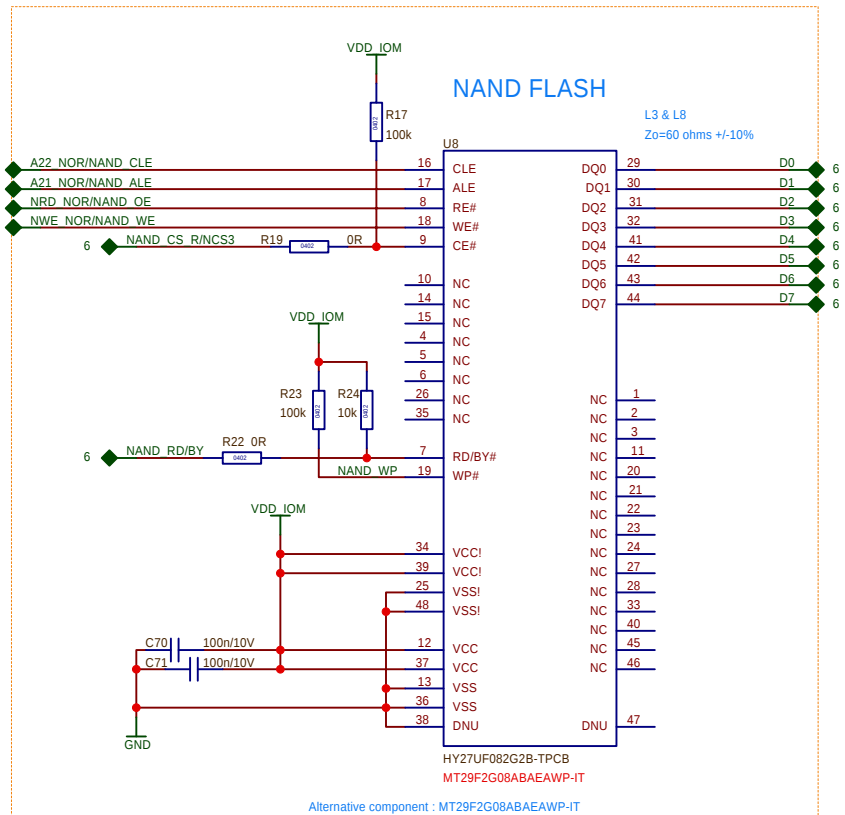
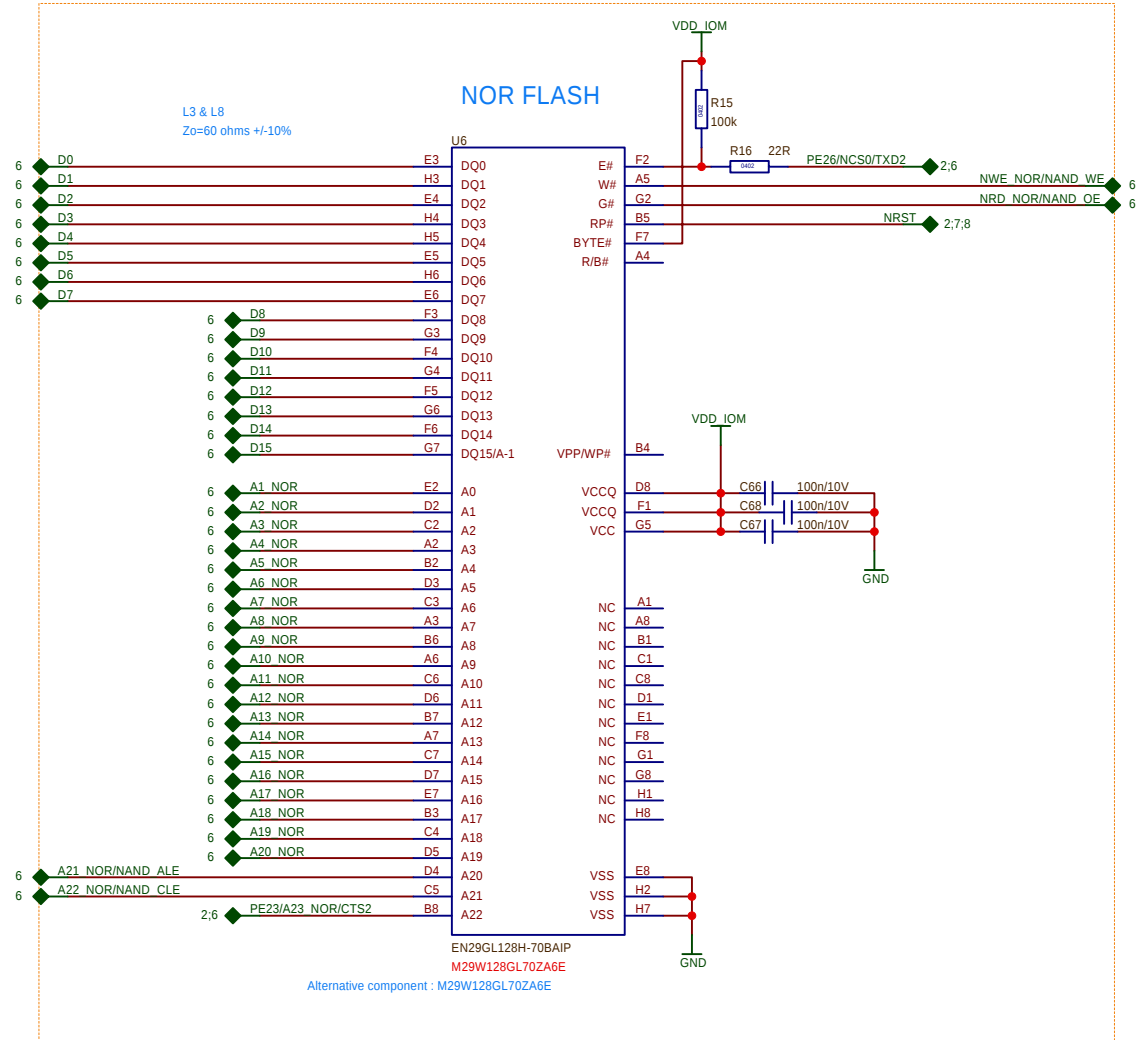
GND pins are provided and should be connected as shortly as possible to the system ground plane.

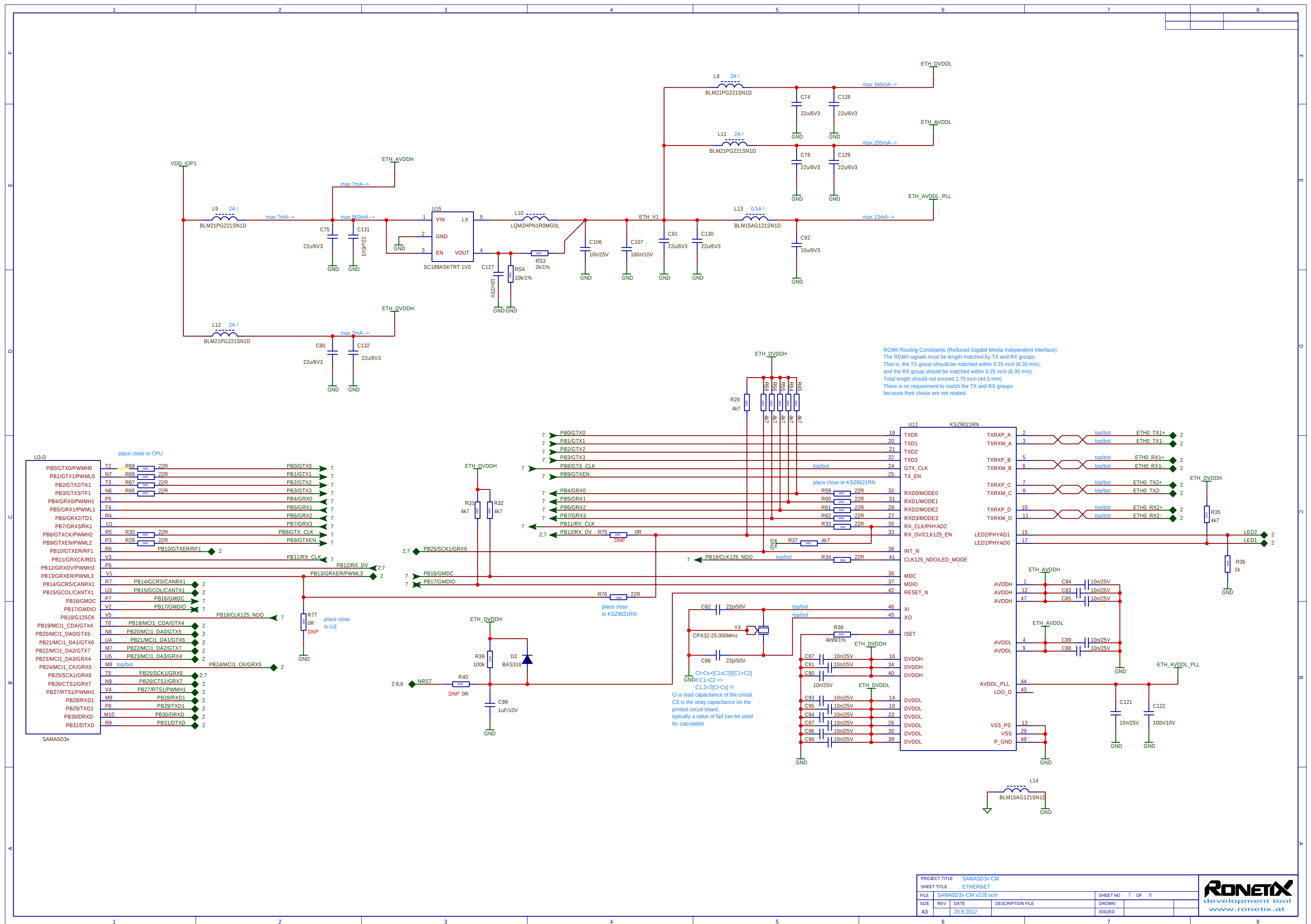






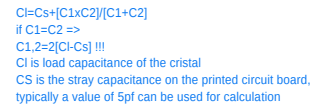
split up (close to microcontroller)  
each trace into X traces according to the number of device targets:  
in this case NAND Flash and NOR Flash





RGMI Routing Constraints (Reduced Gigabit Media Independent Interface):  
The RGMI signals must be length-matched by TX and RX groups.  
That is, the TX group should be matched within 0.25 inch (6.35 mm),  
and the RX group should be matched within 0.25 inch (6.35 mm).  
Total length should not exceed 1.75 inch (44.5 mm).  
There is no requirement to match the TX and RX groups  
because their clocks are not related.

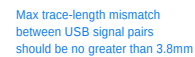
## JTAG Oscillators



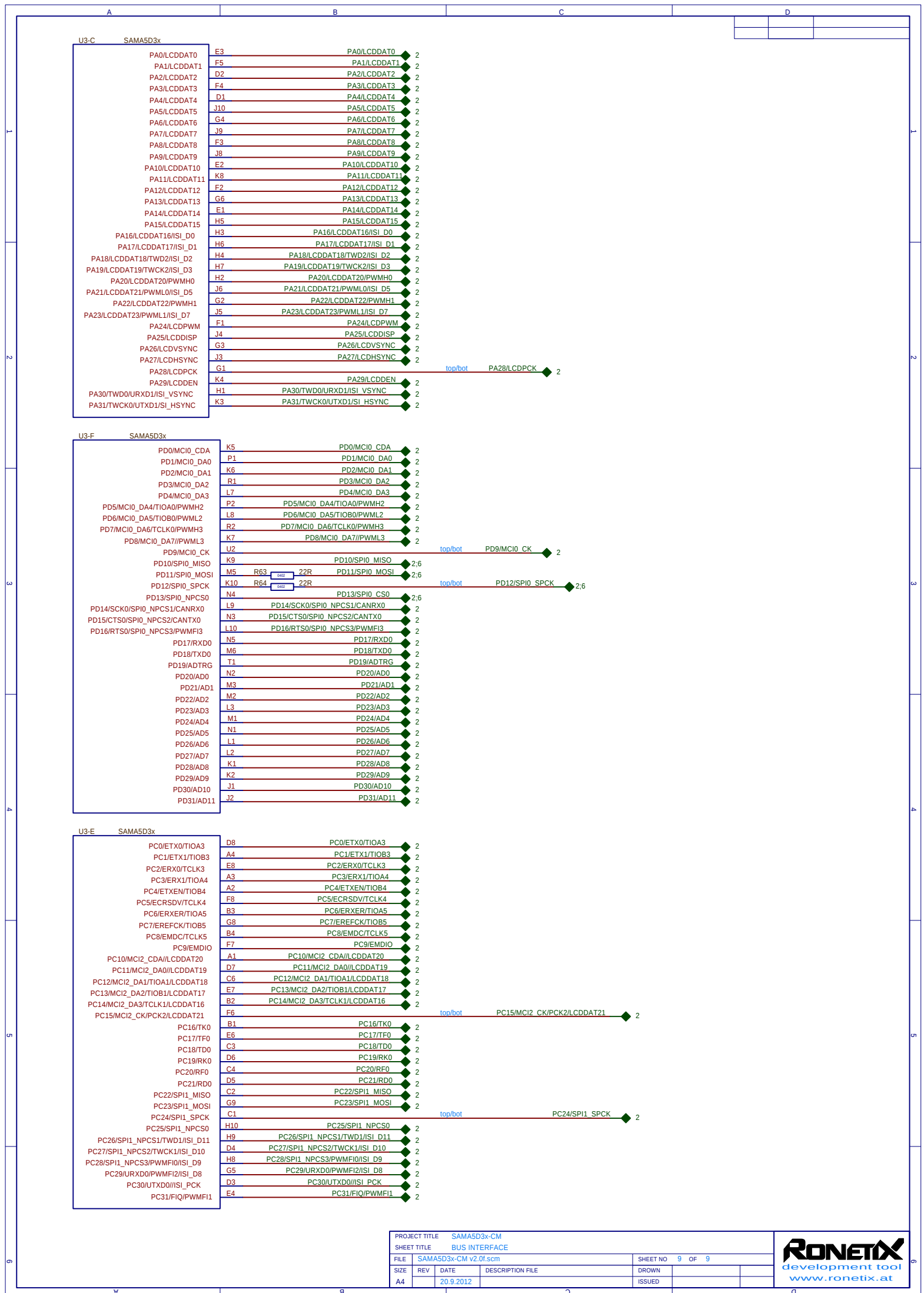
U3-I

HHSDPC  
HHSDMC  
HHSDPB  
HHSDMB  
HHSDPA  
HHSDMA  
VBG

SAMA5D3x



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## 5. Main Board (MB)

### 5.1 Main Board Overview

The SAMA5D3 series main board (MB) hosts any of the SAMA5D31/33/34/35/36 CPU module boards (CM). The main board features all necessary peripheral devices and interfaces for processor evaluation.

Figure 5-1. Main Board Top View

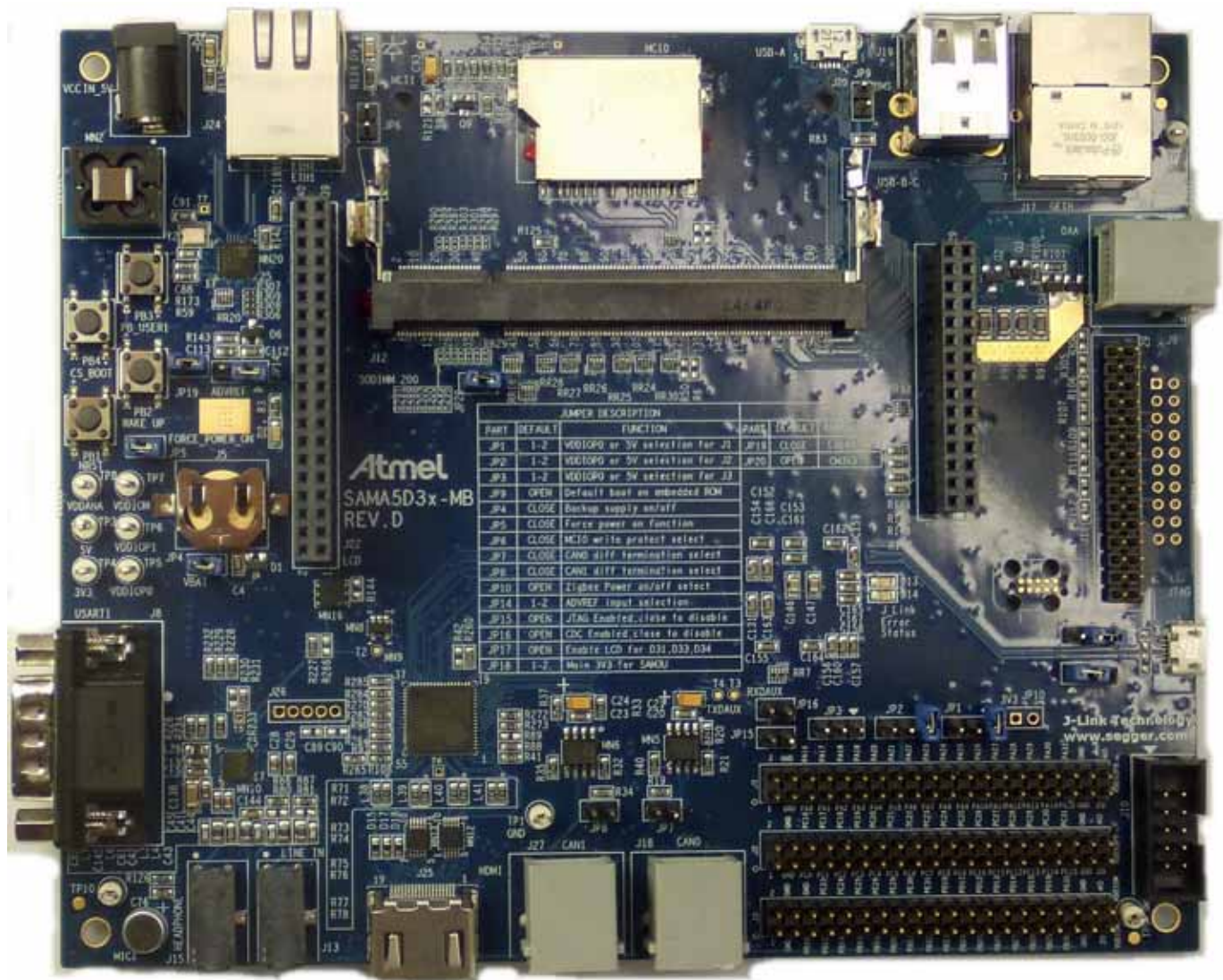
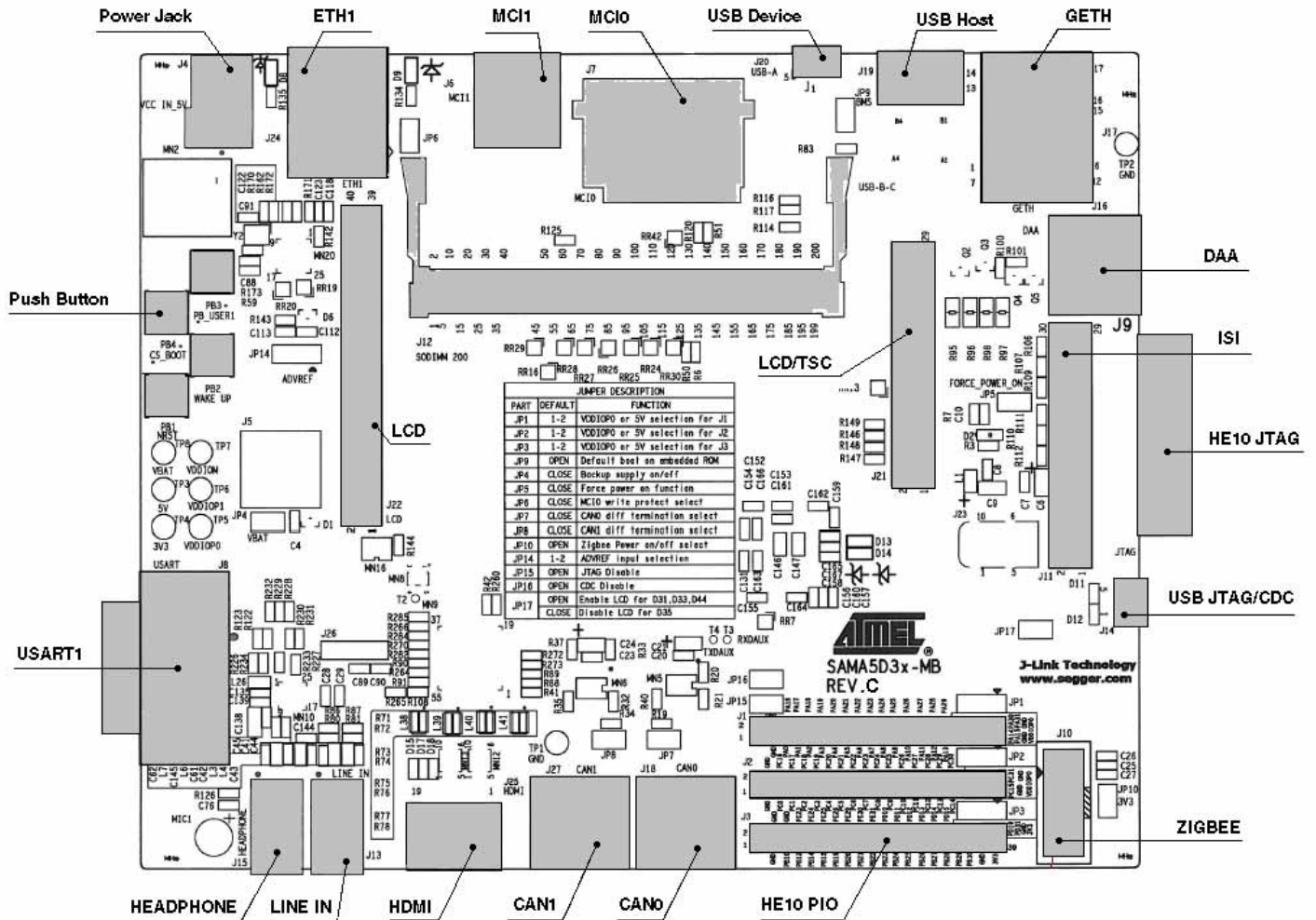


Figure 5-2. Annotated MB Layout



### 5.1.1 Equipment List

The SAMA5D3 series MB is a full-featured motherboard. It can be used with all available SAMA5D3 series CM boards.

### 5.1.2 Technical Specifications

**Table 5-1. MB Technical Specifications**

| Characteristic            | Specifications                                                                                                                                                                                                                                  |
|---------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Supported Module          | All SAMA5D3 series computer modules                                                                                                                                                                                                             |
| Expansion Slots           | One 200-pin SODIMM socket                                                                                                                                                                                                                       |
| Mass Storage Interface    | Two high-speed memory card hosts<br>1 x SD card slot (can also read MMC cards)<br>1 x micro SD card slot                                                                                                                                        |
| I/O                       | 3 x 20 pin header<br>1 x 20 + 1 x 15 pin header LCD connector<br>1 x 10 pin header ISI connector (Image Sensor)<br>One 1-Wire EEPROM DS28EC20<br>One power LED                                                                                  |
| Communication             | 1 x Gigabit Ethernet<br>1 x 10/100 MHz Ethernet<br>2 x USB High-speed 2.0 Host<br>1 x USB High-speed 2.0 Host/Device<br>1 x USARTs, 1 x DBGU<br>2 x CAN connectors<br>1 x 10-pin header ZigBee connector<br>1 x Smart DAA (Softmodem interface) |
| Sound                     | Wolfson's 8904 Mic in, Headphone out signals                                                                                                                                                                                                    |
| Video                     | 1 x HDMI                                                                                                                                                                                                                                        |
| LCD                       | LCD TFT Controller with overlay, alpha-blending, rotation, scaling and color space conversion                                                                                                                                                   |
| ISI                       | ITU-R BT. 601/656 Image Sensor Interface                                                                                                                                                                                                        |
| Debug                     | 1 x On-board SAM-ICE™<br>1 x Bridge USB/UART DBGU                                                                                                                                                                                               |
| CMOS Battery              | On-board Lithium Battery for CMOS backup                                                                                                                                                                                                        |
| Power                     | System power: +5V DC +/-5%<br>Backup: +1.65V to 3.6V DC                                                                                                                                                                                         |
| RoHS status               | Compliant                                                                                                                                                                                                                                       |
| CE and FCC Part 15 status | Compliant                                                                                                                                                                                                                                       |
| Dimensions                | 165 * 135 * 20 mm                                                                                                                                                                                                                               |

Note: Some of the features mentioned in the above feature summary table are optional. Check the article number of your module and compare it to the option information list on [Table 3-1 "Evaluation Kit Features"](#) of this user guide to determine which options are available with your particular module.

### 5.1.3 Devices

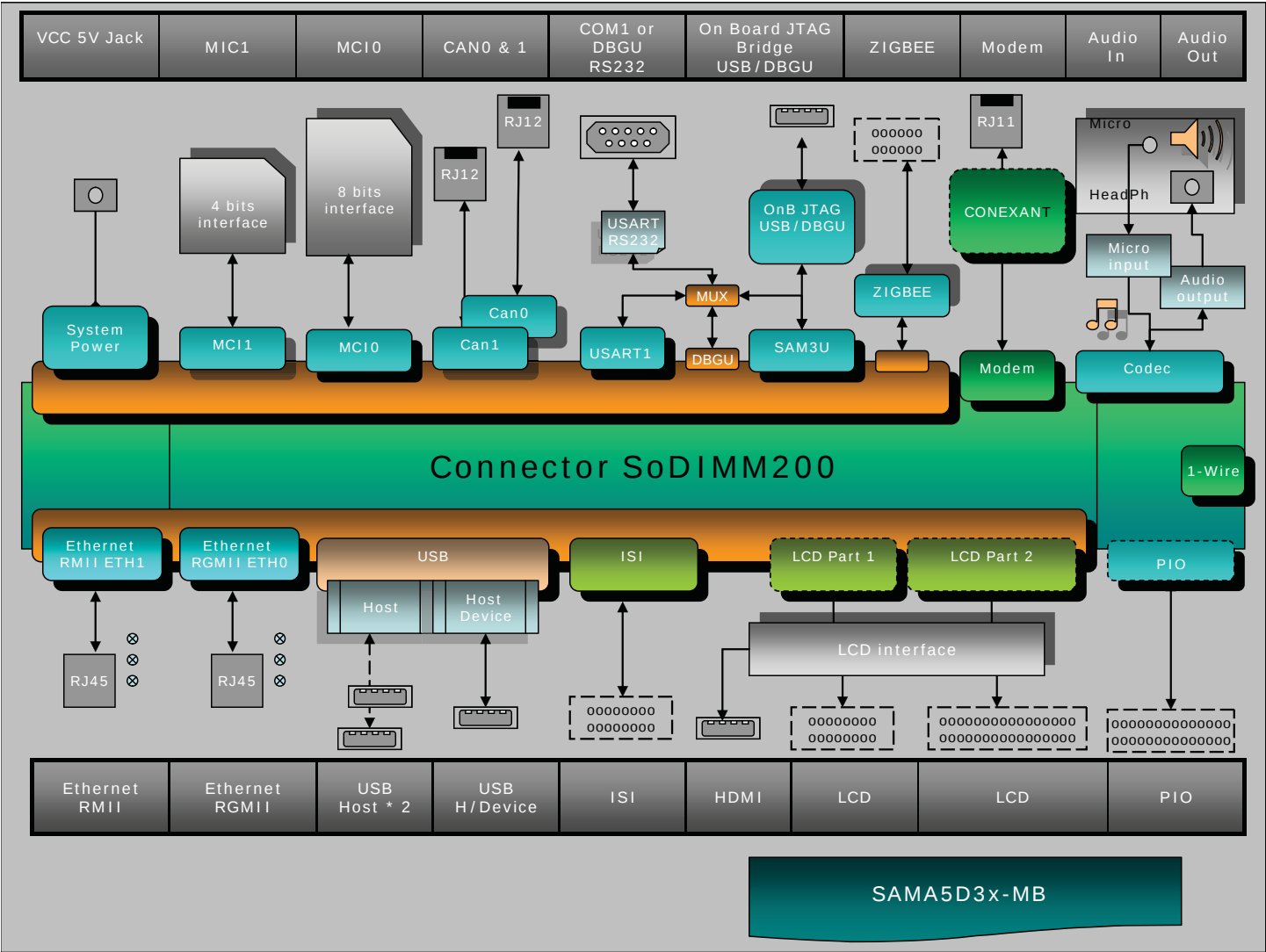
List of the MB board peripherals:

- Two EMAC PHY
- One audio CODEC
- Two high-speed MCI card interfaces
- Two CAN transceivers
- One RS232 port with level translator features USART1
- One Smart DAA port
- Two USB host ports
- One USB host/device port
- On-board power regulation
- LCD/ISI extension interface
- HDMI interface
- ZigBee® interface
- One-wire device

### 5.1.4 Board Interface Connection

- Main power supply (J4)
- 200 positions socket (as defined in SODIMM 200), 0.6mm pitch (J12)
- USB A Host/Device, support USB host/device using a micro AB connector (J20)
- USB B Host, support USB host using a type A connector (J19, upper)
- USB C Host, support USB host using a type A connector (J19, lower)
- USB-to-serial bridge on DBGU, and JTAG-OB functionality (J14)
- USART1 (RX, TX, RTS, CTS) connected to a 9-way male RS232 connector (J8)
- JTAG, 20-pin IDC connector (J9)
- MicroSD connector (J6)
- SD/MMC connector (J7)
- Gigabit Ethernet ETH0 (J17)
- Ethernet ETH1 (J24)
- Headphone (J15), line (J13)
- Image sensor connector (J11)
- HDMI connector (J25)
- Expansion connector with all LCD controller signals for DM board connection (QTouch, TFT LCD display with touchscreen and backlight (J21, J22))
- DAA connector RJ11 6P4C type (J16)
- CAN bus connectors RJ12 6P6C type (J18, J27)
- ZigBee connector (J10)
- Battery socket (J5)
- Three expansion connectors with PIO signals (J1, J2, J3)
- Test points; various test points are located throughout the board

Figure 5-3. MB Architecture

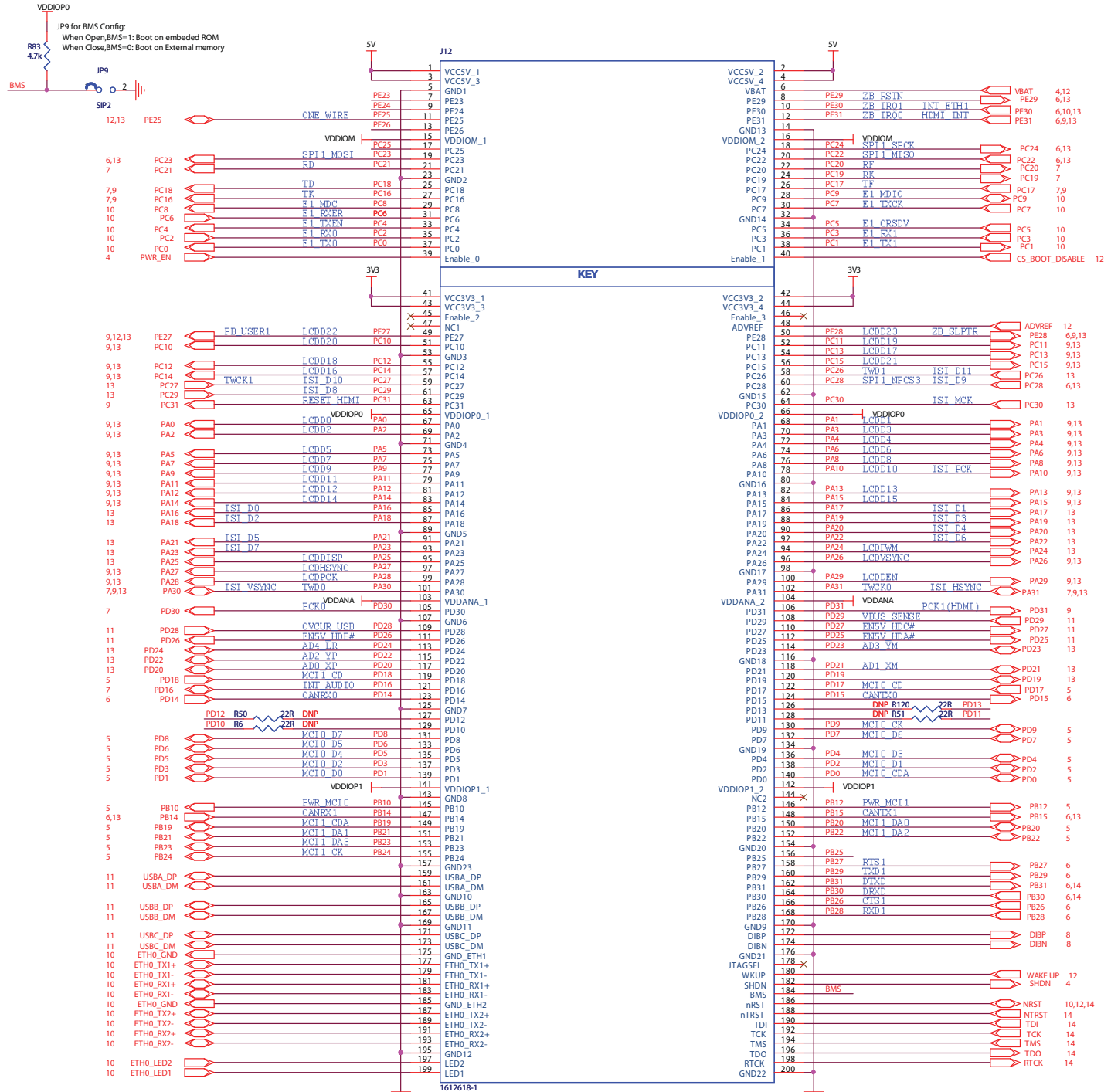


## 5.2 Function Blocks

### 5.2.1 Processor

The SAMA5D3 series MB board may be used with any of the SAMA5D31/D33/D34/D35/SAMA5D36 CPU modules.

Figure 5-4. SODIMM Interface on MB





### 5.2.3 Debug JTAG/ICE and DBGU

The MB includes a built-in SEGGER J-Link-on-Board device. The functionality is implemented with an ATSAM3U4C microcontroller in an LQFP100 package.

The ATSAM3U4C provides the functions of JTAG and a bridge USB/Serial DBGU port.

Two LEDs D13 and D14 that are mounted on the main board signal the status of the J-Link-on-Board device.

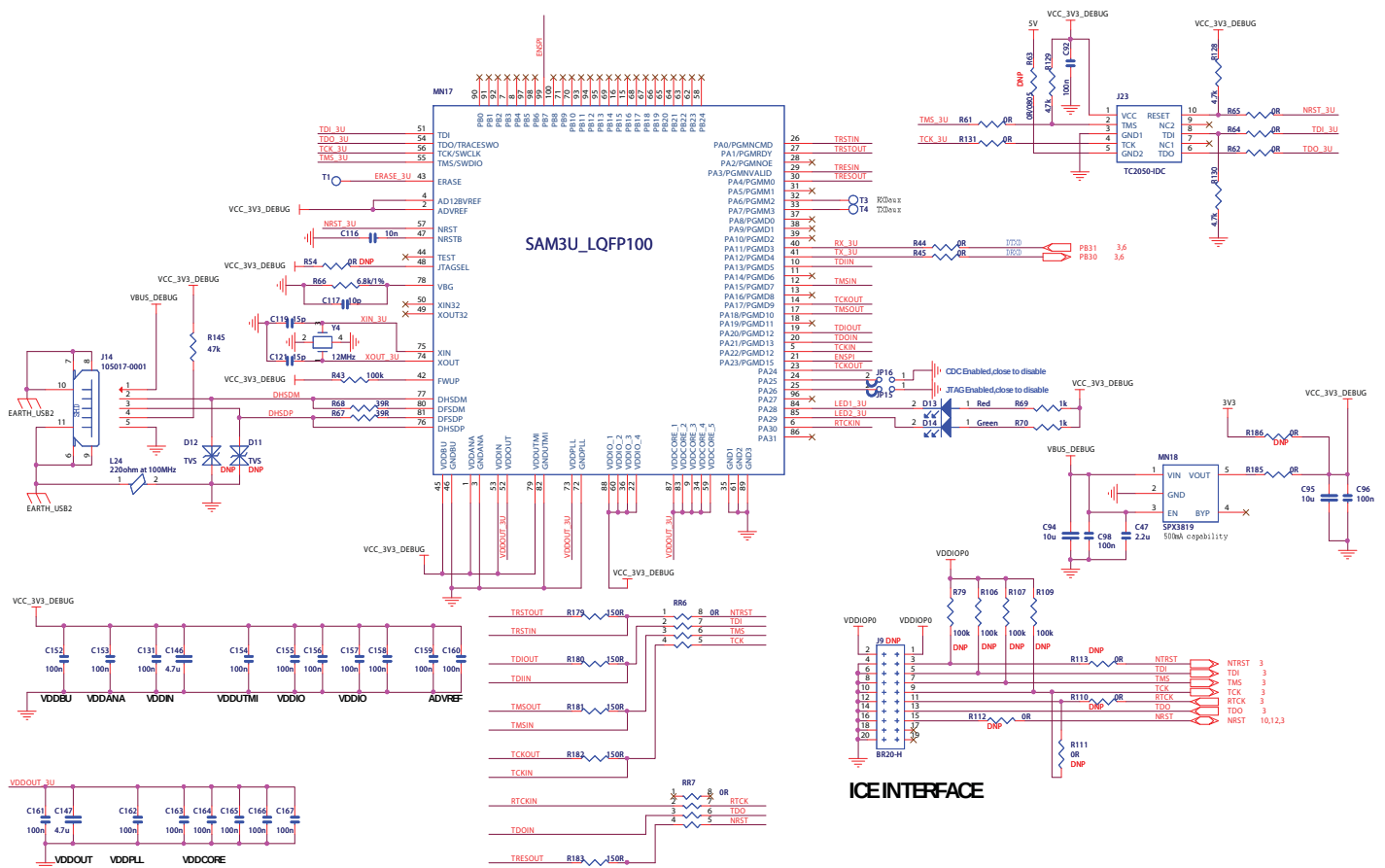
The J-Link-OB-ATSAM3U4C was designed in order to provide an efficient, on-board alternative to the general J-Link.

J-Link-OB-ATSAM3U4C supports the following target interfaces:

- JTAG
- DBGU

An optional 20-pin header is provided on the board to allow for the JTAG connection. In order to use this functionality, RR6 and RR7 must be removed and JP15 jumper must be in place.

Figure 5-6. MB JTAG-OB



### 5.2.3.1 Disabling J-Link-OB-ATSAM3U4C

Jumper JP15 disables the J-Link-OB-ATSAM3U4C JTAG functionality. When the jumper is installed, it grounds Pin 25 of the ATSAM3U4C that is normally pulled high. This signals to the microcontroller it must not provide JTAG support.

- Jumper JP15 not installed: J-Link-OB-ATSAM3U4C is enabled and fully functional
- Jumper JP15 installed: JTAG functionality is disabled

Jumper J15 disables only J-Link functionality. The debug serial port (DBGU) that is emulated through a communication device class (CDC) of the same USB connector remains operational.

The built-in JTAG controller does not have to be explicitly disabled to use an external JTAG controller through the 20-pin JTAG port. The internal J-Link-OB connects to a target only after it receives a first command; otherwise, it remains disabled.

### 5.2.3.2 Hardware UART via CDC

In addition to J-Link-OB functionality, the ATSAM3U4C microcontroller LAO provides a bridge to a debug serial port (DBGU) of the processor on a CM board. The port is made accessible over the same USB connection used by JTAG by implementing communication device class (CDC), which allows terminal communication with the target device.

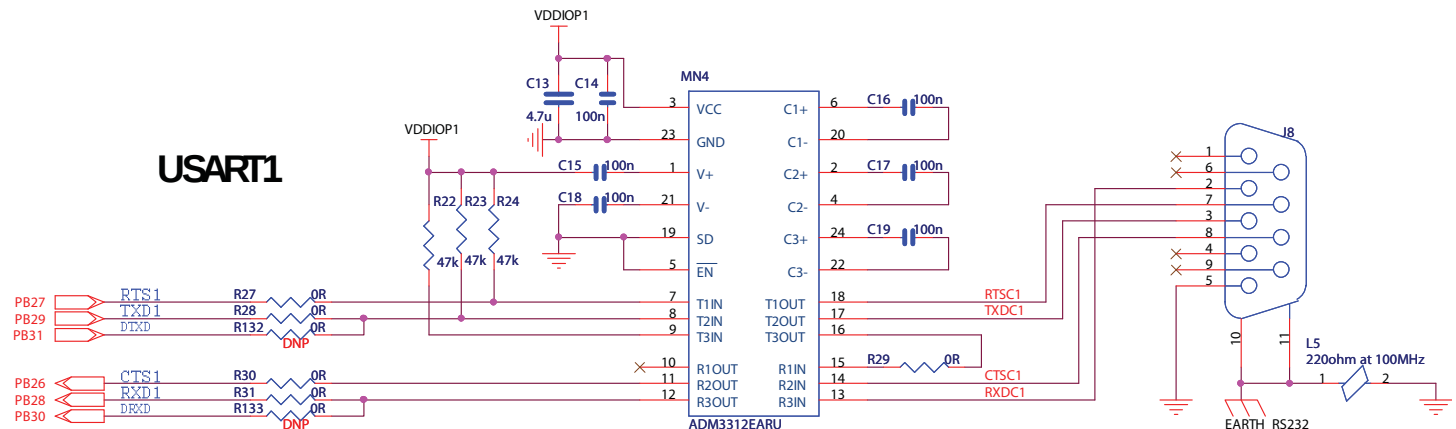
This feature is enabled only if the microcontroller Pin 24 is not grounded. The pin is normally pulled high and controlled by jumper JP16.

- Jumper JP16 not installed: the device is enabled
- Jumper JP16 installed: the CDC device is disabled

### 5.2.4 USART

The USART1 is used as a user serial communication port. This USART provides an RS-232 interface with transceiver TXD, RXD lines and hardware flow control CTS/RTS lines. The device uses a DB-9 male connector. The software must drive the appropriate PIO pins to enable the USART function.

Figure 5-7. USART1 Com Port



## 5.2.5 USB Ports

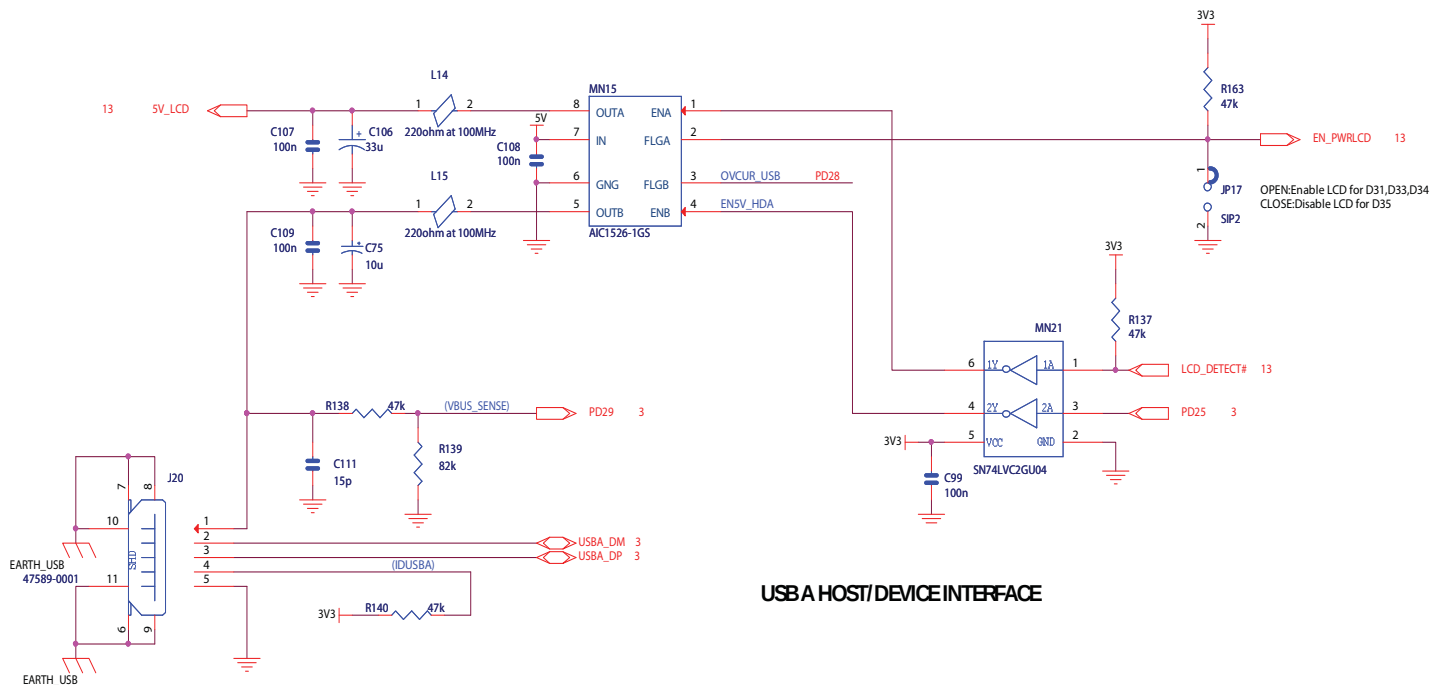
The SAMA5D3 series MB features three USB communication ports:

- Port A High-speed (EHCI) and full-speed (OHCI) host multiplexed with USB Device  
High-speed micro AB connector, J20
- Port B High-speed (EHCI) and full-speed (OHCI) host  
Standard type A connector, J19 upper port
- Port C Full-speed (OHCI) only host  
Standard type A connector, J19 lower port

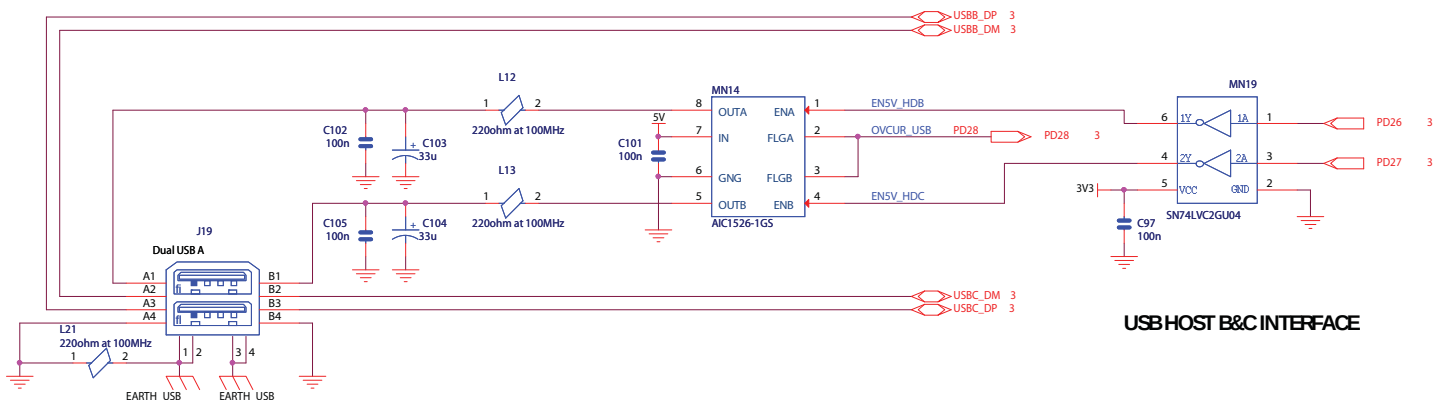
All three USB host ports are equipped with 500 mA high-side power switch for self-powered and bus-powered applications. The USB device port feature VBUS insert detection function through the resistor ladder R138 and R139.

Refer to the embedded MPU product datasheet for detailed programming information, available on [www.atmel.com](http://www.atmel.com).

**Figure 5-8. USB Port A**



**Figure 5-9. USB Ports B and C**

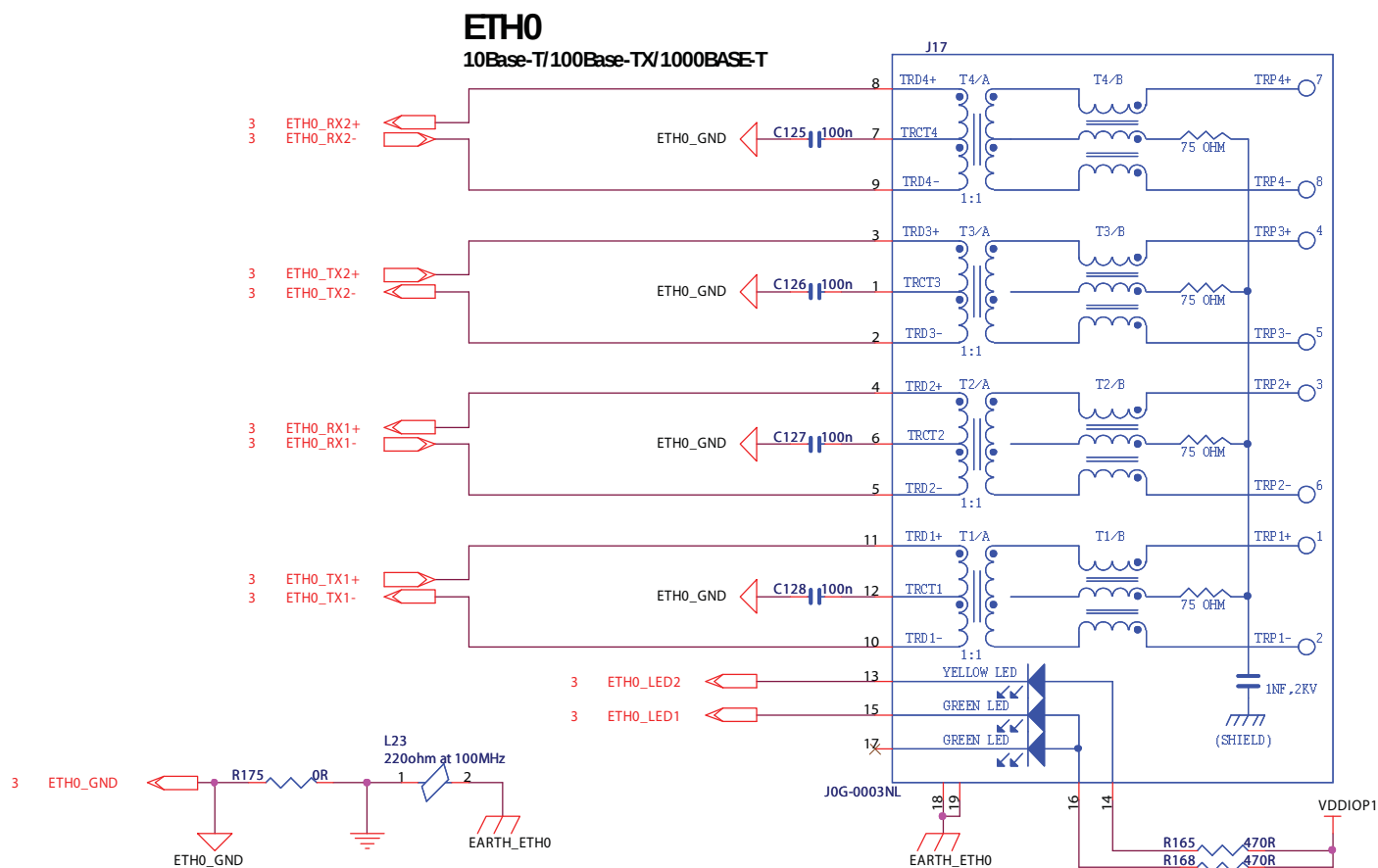


## 5.2.6 Ethernet 10/100 (EMAC) Port

The main board contains a MICREL PHY device (KSZ8051) handling Ethernet connectivity at 10/100 Mbps. The device supports MII and RMII interface modes.

There are two independent PHY devices placed on CM and MB boards that connect to two separate RJ-45 connectors and that contain built-in magnetics and status LEDs. The LEDs are driven by PHY devices to indicate activity, link and speed status for the respective Ethernet ports.

Figure 5-10. ETH0 Port





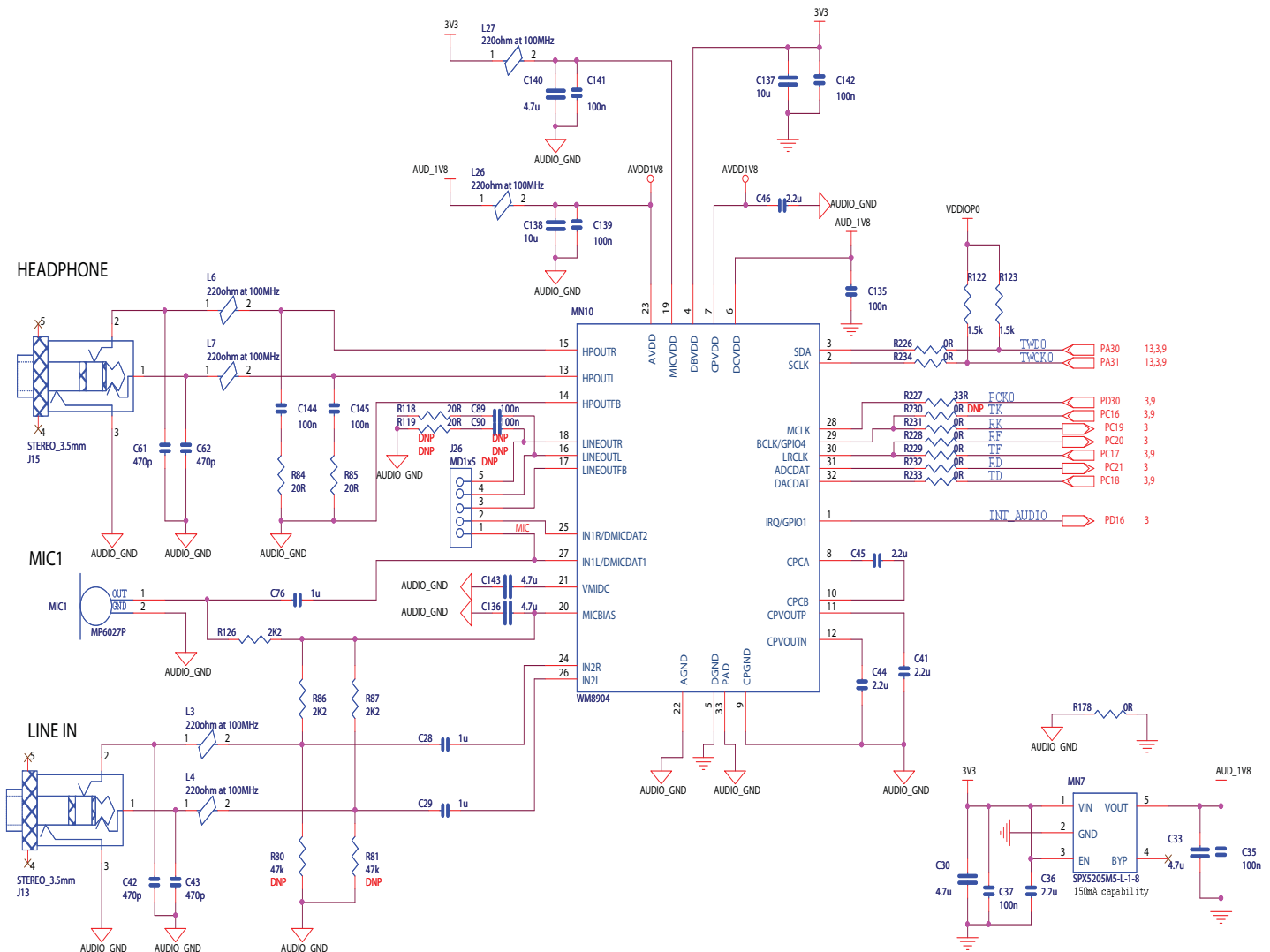
## 5.2.7 Audio

The MB includes a WM8904 CODEC that provides route to handle audio in the digital domain. The interface includes audio jacks for line input (J13) and headphone line output (J15). It also connects to an electret microphone, which is conveniently installed on the main board.

This interface can be used to play and record audio. The WM8904 chip has left and right channel line inputs, a microphone input and an on-board microphone, as well as a left and right headphone output. The line in and headphones can be connected through two 2.5 mm J13 and J15 audio jacks. A stereo microphone input (or a second left/right line input) and left/right line outputs are connected to a 5-pin header (J26). The header is not installed normally.

The SAMA5D3 series processor is configured in IIS slave mode to interface with the WM8904 CODEC.

Figure 5-12. Audio Interface



## 5.2.8 HDMI Transmitter Interface

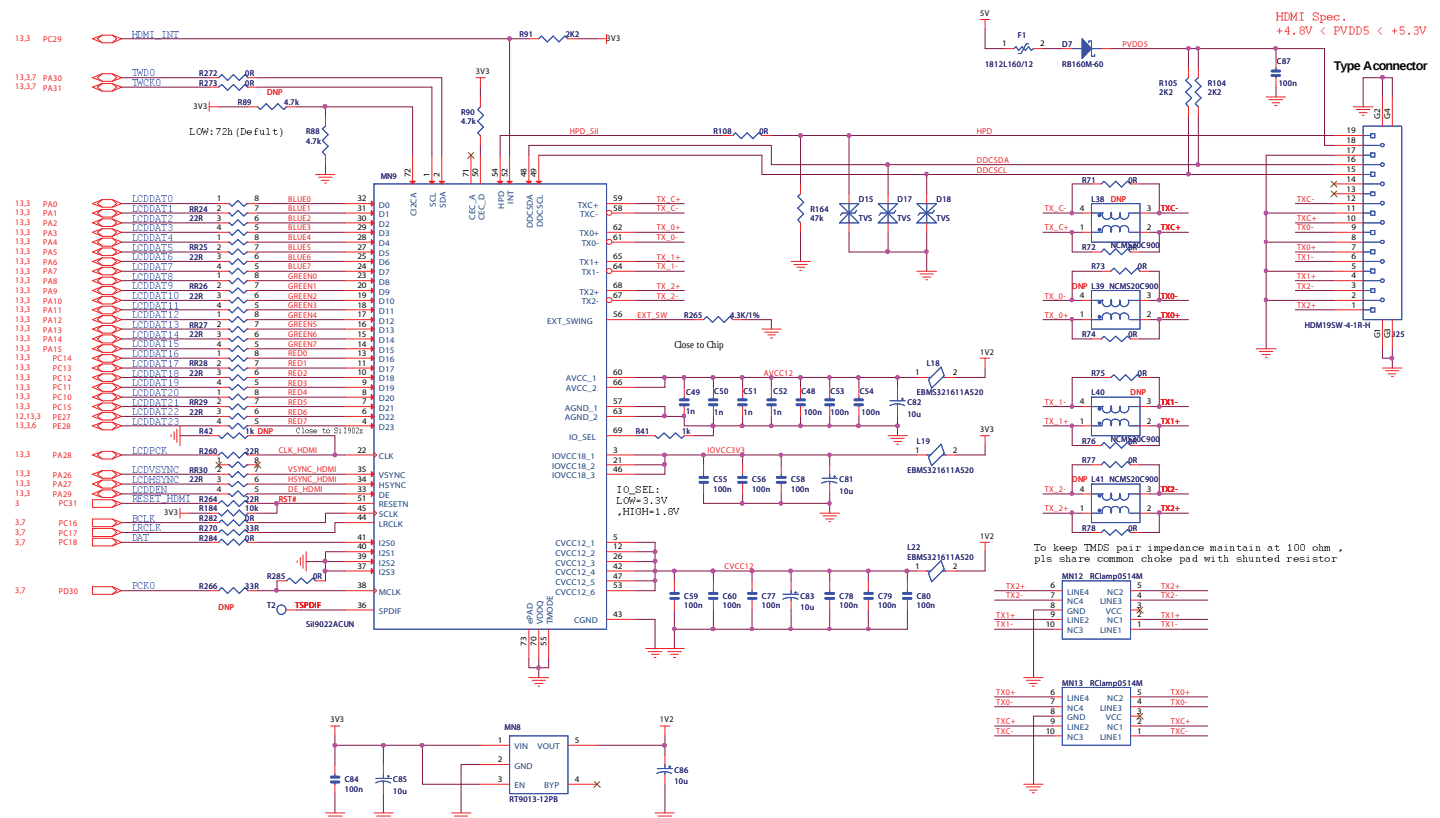
The Main Board (MB) is equipped with an HDMI transmitter interface.

The SiI9022/9024 HDMI Tx provides a complete solution for transmitting HDMI compliant digital audio/video. Specialized audio/video processing is available within the transmitter to easily and cost-effectively add HDMI capability to consumer electronics devices.

The user must use an HDMI cable to connect to a monitor. This cable is not provided with the SAMA5D3 series-EK. A standard HDMI cable can be used.

**Important:** Do not plug in the HDMI connector to a display with the evaluation kit powered on. Be certain that the EK board is not powered, plug in the cable to the display and then power on the SAMA5D3 series EK board.

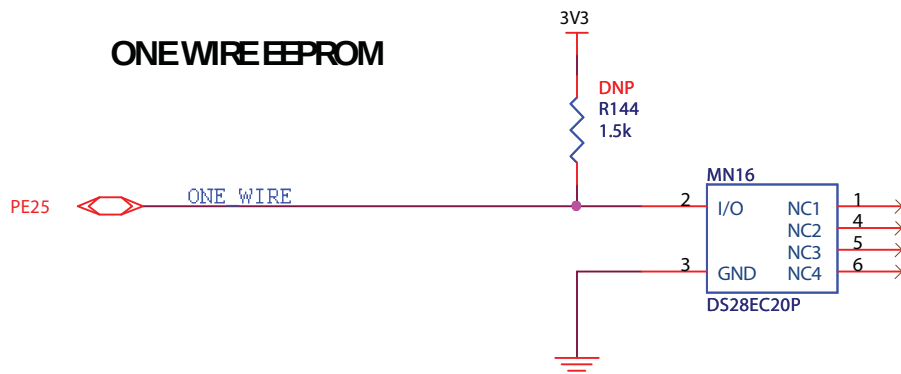
Figure 5-13. HDMI Interface



## 5.2.9 1-Wire EEPROM

The MB also features a 1-wire device as a “software identification label” to store information such as chip type, manufacture name, production date, etc.

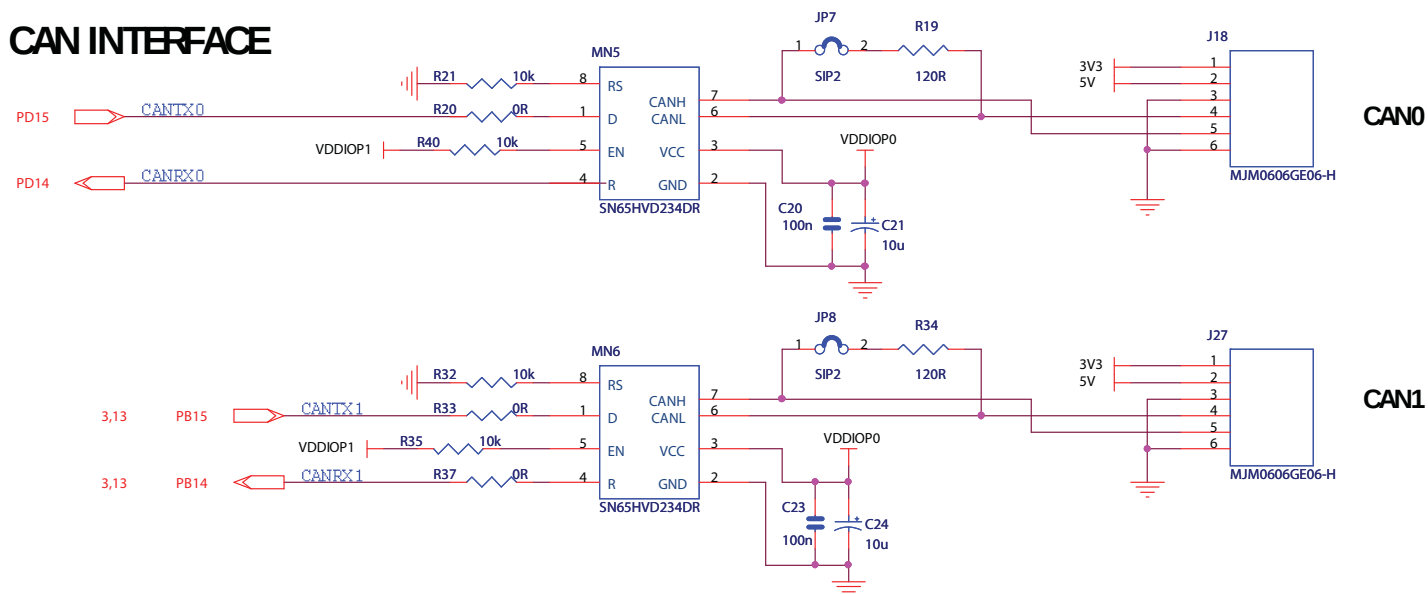
Figure 5-14. 1-Wire on MB



## 5.2.10 CAN Bus

The MB offers two CPU-controlled Controller Area Network (CAN) interfaces with transceivers available through connectors J18 and J27.

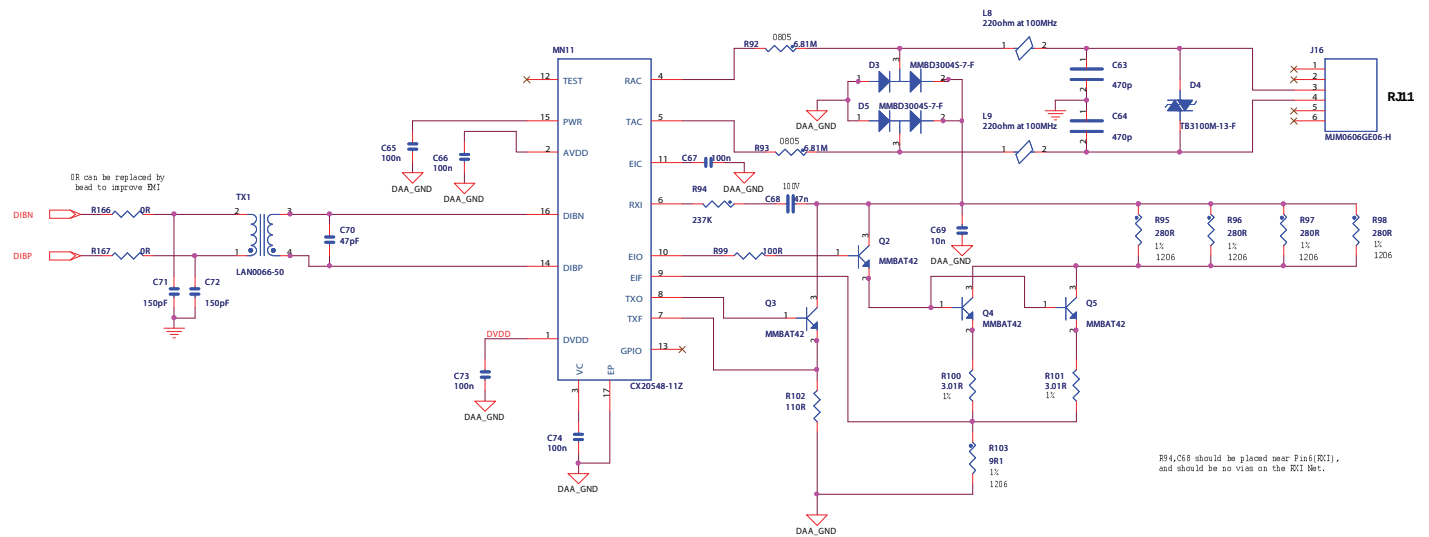
Figure 5-15. CAN on MB



## 5.2.11 Smart DAA

The SAMA5D3 series MB features a Smart DAA chip to drive an analog telephone line on RJ11 6P4C port (J16).

Figure 5-16. Smart DAA



## 5.2.12 SD/MMC Interface

SD/MMC is a standard Secure Digital/MultiMedia Card interface.

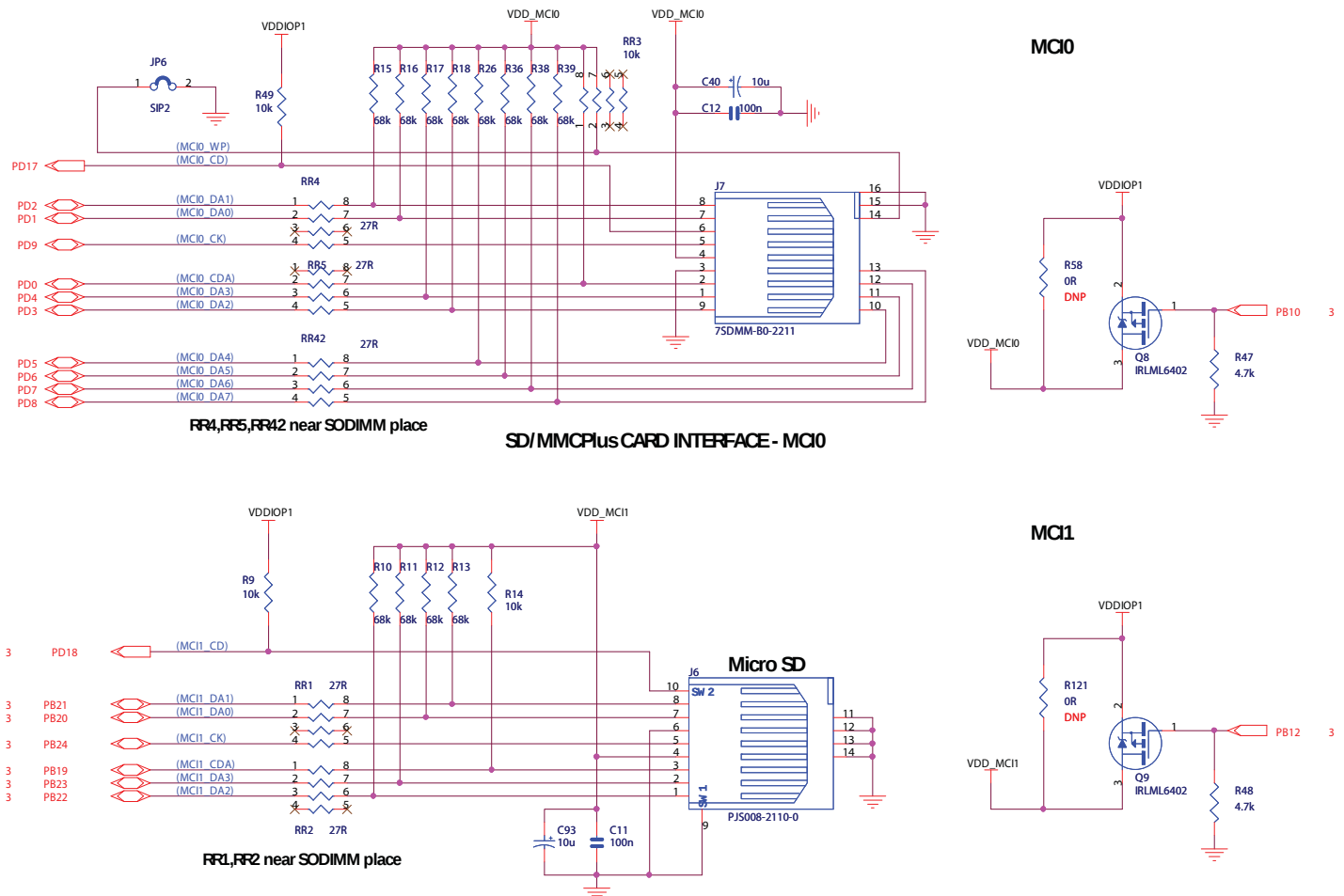
The MB has two high-speed Multimedia Card Interfaces (MCI).

- The first interface is used as an 8-bit interface (MCI0), connected to an SD/MMC card slot.
- The second interface is used as a 4-bit interface (MCI1), connected to a MicroSD card slot.

Each power line is on by default and is connected to a MOSFET controlled by a PIO to switch on or off the SD card power.

Note: The power is connected to VCC, which is 3.3V.

Figure 5-17. SD/MMC Interface



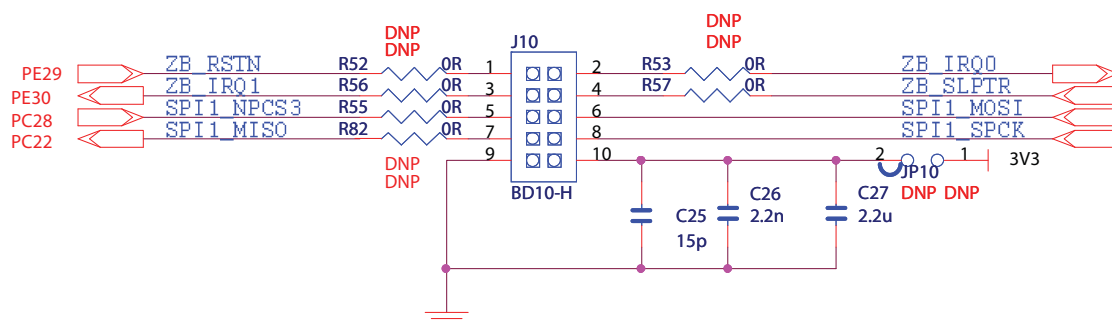
### 5.2.13 ZigBee

The MB has a 10-pin male connector for the Atmel RZ600 ZigBee module.

Not populated (DNP) 0 Ohm resistors have been implemented in series with the PIO lines that are used elsewhere in the design. This ensures that in case of a conflict in the user application, the lines can be disconnected individually.

Figure 5-18. ZigBee Interface

#### ZIGBEE INTERFACE



### 5.2.14 LED Indicators

The main board has one red LED (D2) that is on when the board is powered.

There are two additional LEDs on the main board that are associated with on-board JTAG port. See [Section 5.2.3 "Debug JTAG/ICE and DBGU"](#).

### 5.2.15 Pushbutton Switches

- One reset, board reset (BP1)
- One wake-up, pushbutton to bring the processor out of low-power mode (BP2)
- One user momentary pushbutton
- One boot memory Chip Select (CS), disabling the pushbutton (refer to [Section 4.2.4.1 "Boot Configuration"](#)).

#### 5.2.15.1 Reset

When pressed and released, this pushbutton causes a power-on reset of the SAMA5D3 series EK (MB, CM and DM boards).

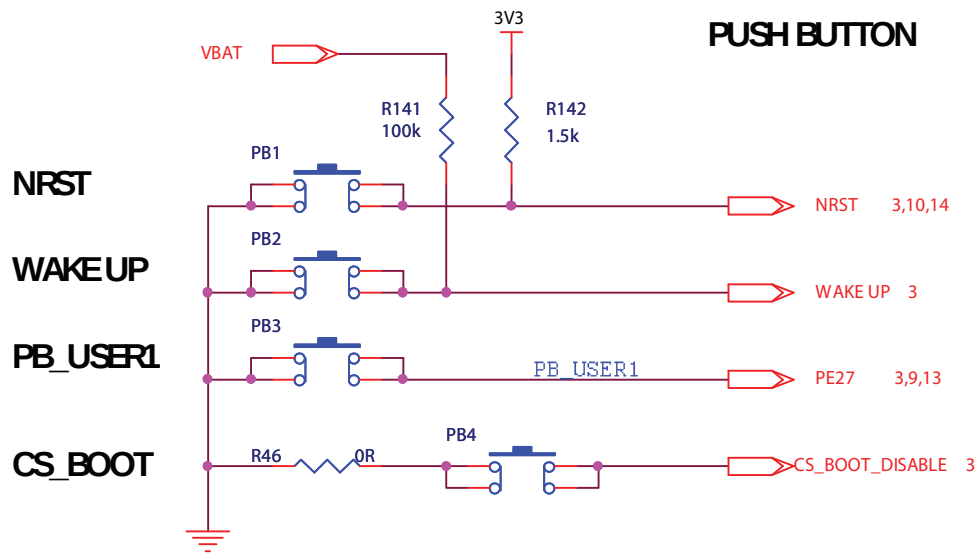
### 5.2.15.2 CS\_BOOT Button

The CS\_BOOT can be used to prevent the system from booting out of external memories (NANDFlash, SPI Flash). The purpose is mainly to execute the SAM-BA part of the ROM code.

Two methods can be used:

1. Press the CS\_BOOT and power-cycle the board.
2. Press the CS\_BOOT and then press the NRST button.

Figure 5-19. Pushbutton

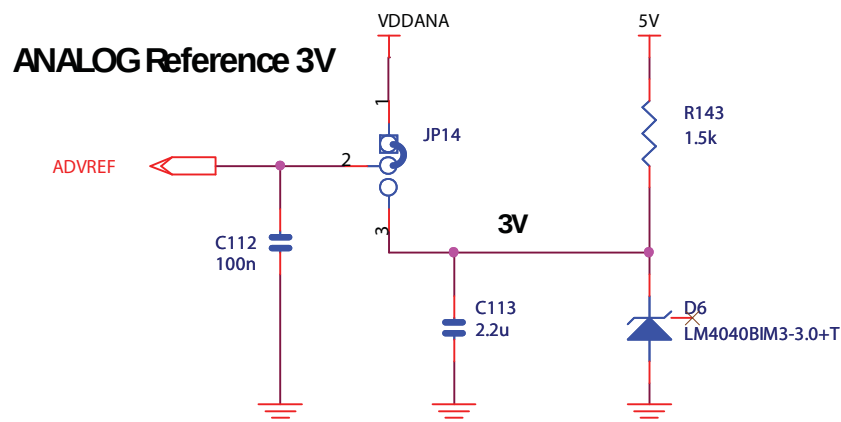


### 5.2.16 Analog Reference

The 3V voltage reference is based on an LM4040 (Precision Micropower Shunt Voltage Reference).

This ADVREF level can be set as 3V or 3.3V via the jumper JP14.

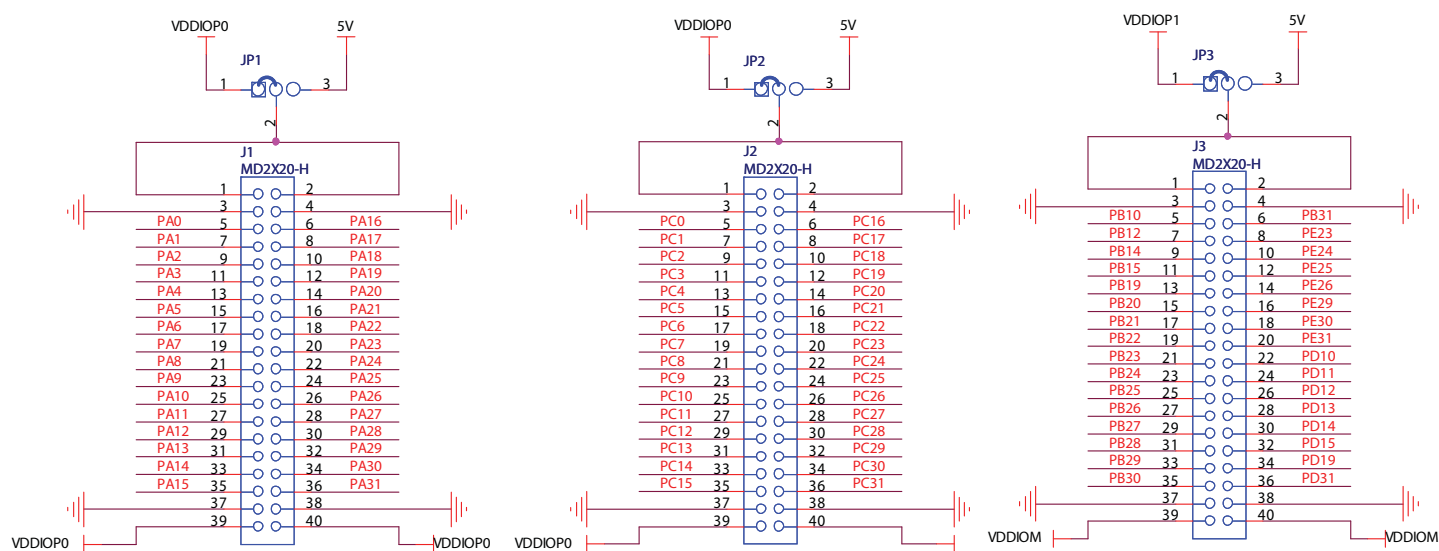
Figure 5-20. Analog Reference



## 5.2.17 Expansion Ports

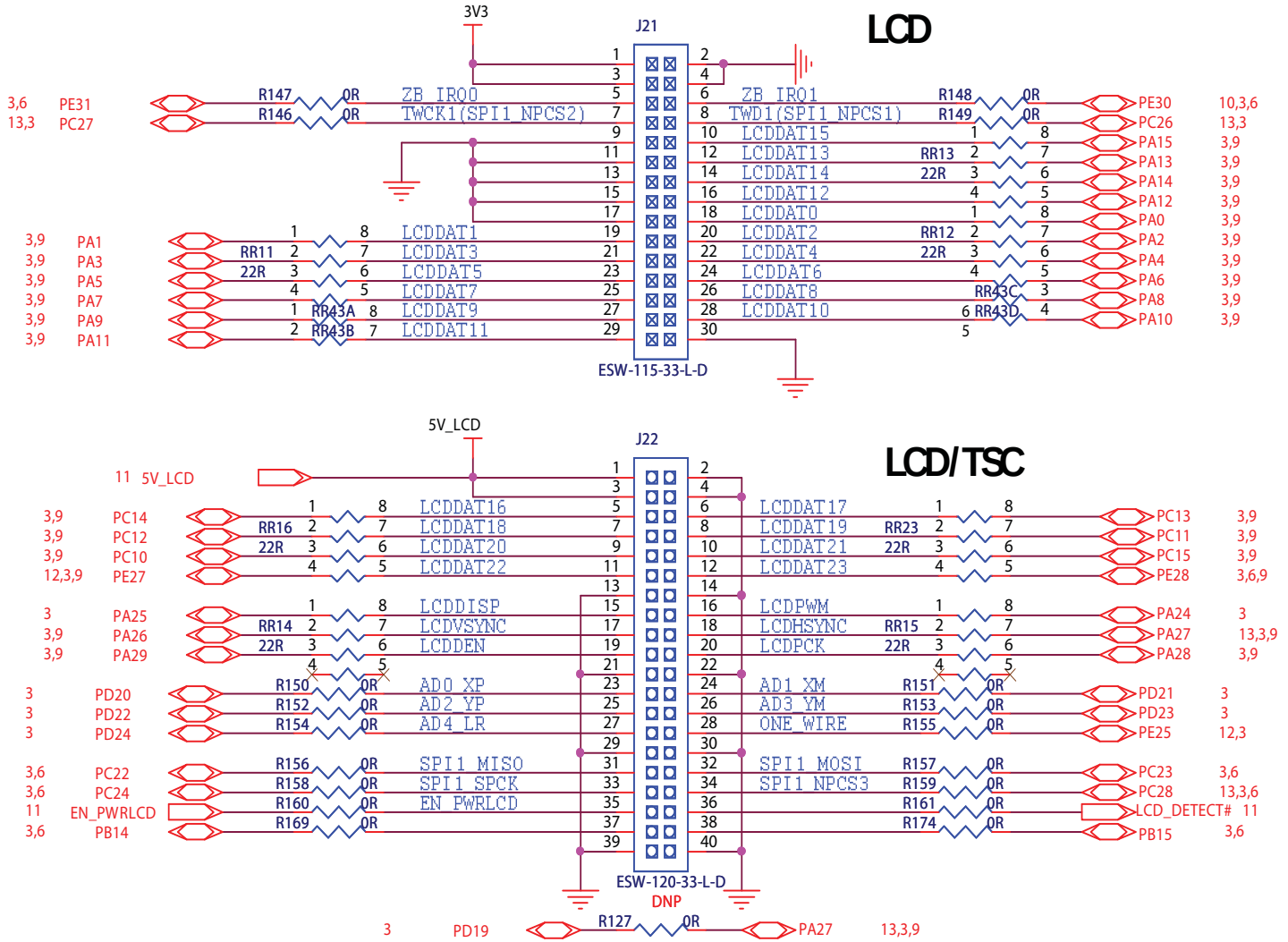
Three 40-pin headers (J1, J2, J3) are provided on the board to allow for the PIO connection of various expansion cards that could be developed by the users or other sources. Due to multiplexing, different signals can be provided on each pin.

Figure 5-21. I/O Expansion



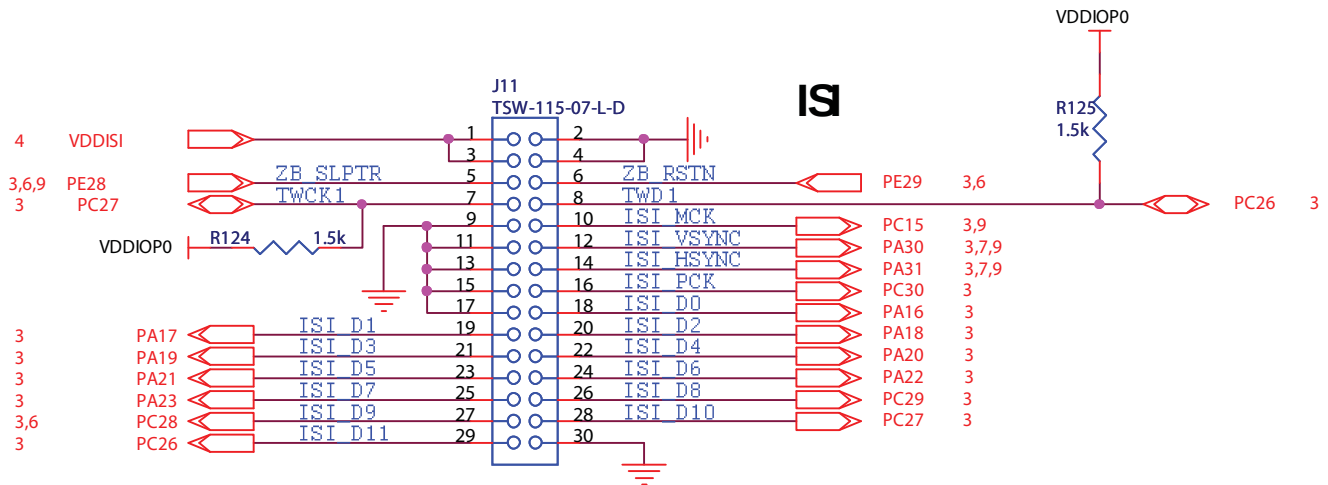
Two connectors (J21, J22) are provided on-board to interface the optional LCD and touchscreen display module (DM) board.

Figure 5-22. LCD Expansion



All I/Os of the SAMA5D3 series Image Sensor Interface (ISI) are routed to connectors J11.

Figure 5-23. ISI Expansion



## 5.3 Configuration

Table 5-2 describes the PIO usage, the jumpers, the test points and the solder drops of a SAMA5D3 series EK board.

**Table 5-2. Jumpers and Solderdrops**

| Reference | Default | Function                                                    |
|-----------|---------|-------------------------------------------------------------|
| JP1       | 1-2     | VDDIOP0 or 5V selection for J1                              |
| JP2       | 1-2     | VDDIOP0 or 5V selection for J2                              |
| JP3       | 1-2     | VDDIOP0 or 5V selection for J3                              |
| JP4       | CLOSE   | Backup supply on/off                                        |
| JP5       | CLOSE   | Force power on function                                     |
| JP6       | CLOSE   | MCIO write protect select                                   |
| JP7       | CLOSE   | CAN0 diff termination select                                |
| JP8       | CLOSE   | CAN1 diff termination select                                |
| JP9       | OPEN    | Default boot on embedded ROM, close boot on external memory |
| JP10      | OPEN    | ZigBee power on/off select                                  |
| JP11      | —       |                                                             |
| JP12      | —       |                                                             |
| JP13      | —       |                                                             |
| JP14      | 1-2     | ADVREF input selection                                      |
| JP15      | OPEN    | JTAG enable                                                 |
| JP16      | OPEN    | CDC enable                                                  |
| JP17      | OPEN    | Enable LCD for D31, D33, D34                                |
|           | CLOSE   | Disable LCD for D35                                         |
| JP18      | 1-2     | SAM3U powered by main 3V3                                   |

**Table 5-3. Default Not Populated Parts**

| Page | Reference                    | Function                                |
|------|------------------------------|-----------------------------------------|
| 3    | R6,R51,R50,R120              | Optional PD10, PD11, PD12, PD13 from MB |
| 5    | R58                          | Optional for MCIO power supply mode     |
|      | R121                         | Optional for MC11 power supply mode     |
| 6    | R52,R53,R55,R56,R57,R82,JP10 | Optional ZigBee                         |
|      | R132,R133                    | Debug or USART1 option                  |
| 7    | C89,C90,R118,R119,J26        | Optional Audio Line out, MIC in         |
|      | R80,R81                      | Optional MIC level setting              |
|      | R230                         | Optional audio TK                       |
| 9    | L38,L39,L40,L41              | Optional HDMI EMI filter                |
|      | R89                          | HDMI chip I2C address setting           |
|      | R266                         | Optional for I2S PCLK                   |
|      | R42                          | Optional for LCD PCLK                   |

**Table 5-3. Default Not Populated Parts**

| Page | Reference                                 | Function                            |
|------|-------------------------------------------|-------------------------------------|
| 10   | R162,R170,R171,R172,R176,R177,C122,C123   | Optional for KSZ8041NL              |
| 12   | R144                                      | Optional pull up for DS28EC20P      |
| 13   | R127                                      | Optional for ADC trigger            |
| 14   | R79,R106,R107,R109,R113,R110,R112,R111,J9 | Optional JTAG                       |
|      | R54                                       | SAM3U JTAG selection                |
|      | R63                                       | 5V option                           |
|      | D11,D12                                   | USB ESD protect option              |
|      | R186                                      | Main 3V3 optional for VCC_3V3_DEBUG |

## 5.4 PIO Usage and Interface Connectors Details

### 5.4.1 Power Supply

Figure 5-24. Power Supply Connector J4

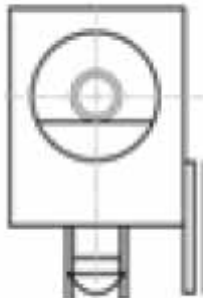


Table 5-4. Power Supply Connector J4 Signal Description

| Pin | Mnemonic | Signal Description |
|-----|----------|--------------------|
| 1   | Center   | +5V                |
| 2   |          | GND                |
| 3   |          | Floating           |

## 5.4.2 JTAG/ICE Connector

Figure 5-25. JTAG J9

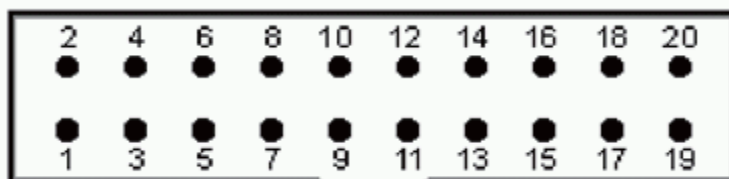


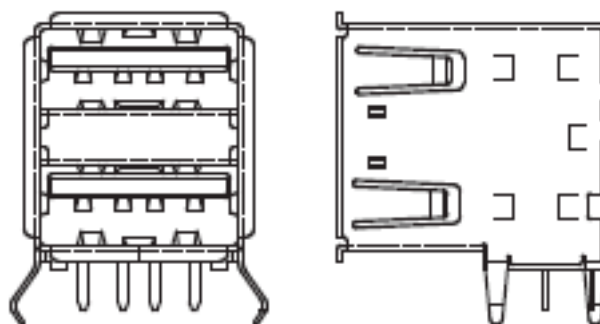
Table 5-5. JTAG/ICE Connector J9 Signal Descriptions

| Pin | Mnemonic                                                                                         | Signal Description                                                                                                                                                                                                                                                                                                                                        |
|-----|--------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1   | VTref 3.3V power                                                                                 | This is the target reference voltage. It is used to check if the target has power, to create the logic-level reference for the input comparators, and to control the output logic levels to the target. It is normally fed from VDD on the target board and must not have a series resistor.                                                              |
| 2   | Vsupply 3.3V power                                                                               | This pin is not connected in SAM-ICE. It is reserved for compatibility with other equipment. Connect to VDD or leave open in target system.                                                                                                                                                                                                               |
| 3   | nTRST Target Reset - Active-low output signal that resets the target.                            | JTAG Reset. Output from SAM-ICE to the Reset signal on the target JTAG port. Typically connected to nTRST on the target CPU. This pin is normally pulled High on the target to avoid unintentional resets when there is no connection.                                                                                                                    |
| 4   | GND                                                                                              | Common ground                                                                                                                                                                                                                                                                                                                                             |
| 5   | TDI Test Data Input - Serial data output line, sampled on the rising edge of the TCK signal.     | JTAG data input of target CPU. It is recommended that this pin is pulled to a defined state on the target board. Typically connected to TDI on target CPU.                                                                                                                                                                                                |
| 6   | GND                                                                                              | Common ground                                                                                                                                                                                                                                                                                                                                             |
| 7   | TMS Test Mode Select.                                                                            | JTAG mode set input of target CPU. This pin should be pulled up on the target. Typically connected to TMS on target CPU. Output signal that sequences the target's JTAG state machine, sampled on the rising edge of the TCK signal.                                                                                                                      |
| 8   | GND                                                                                              | Common ground                                                                                                                                                                                                                                                                                                                                             |
| 9   | TCK Test Clock - Output timing signal, for synchronizing test logic and control register access. | JTAG clock signal to target CPU. It is recommended that this pin is pulled to a defined state on the target board. Typically connected to TCK on target CPU.                                                                                                                                                                                              |
| 10  | GND                                                                                              | Common ground                                                                                                                                                                                                                                                                                                                                             |
| 11  | RTCK - Input Return Test Clock signal from the target.                                           | Some targets must synchronize the JTAG inputs to internal clocks. To assist in meeting this requirement, a returned and retimed TCK can be used to dynamically control the TCK rate. SAM-ICE supports adaptive clocking which waits for TCK changes to be echoed correctly before making further changes. Connect to RTCK if available, otherwise to GND. |
| 12  | GND                                                                                              | Common ground                                                                                                                                                                                                                                                                                                                                             |
| 13  | TDO JTAG Test Data Output - Serial data input from the target.                                   | JTAG data output from target CPU. Typically connected to TDO on target CPU.                                                                                                                                                                                                                                                                               |
| 14  | GND                                                                                              | Common ground                                                                                                                                                                                                                                                                                                                                             |
| 15  | nSRST RESET                                                                                      | Active-low reset signal. Target CPU reset signal.                                                                                                                                                                                                                                                                                                         |

**Table 5-5. JTAG/ICE Connector J9 Signal Descriptions**

| Pin | Mnemonic | Signal Description                    |
|-----|----------|---------------------------------------|
| 16  | GND      | Common ground                         |
| 17  | RFU      | This pin is not connected in SAM-ICE. |
| 18  | GND      | Common ground                         |
| 19  | RFU      | This pin is not connected in SAM-ICE. |
| 20  | GND      | Common ground                         |

### 5.4.3 USB Type A Dual Port

**Figure 5-26. USB Type A Dual Port J19****Table 5-6. USB Type A Dual Port J19 Signal Descriptions**

| Pin             | Mnemonic     | PIO | Signal Description |
|-----------------|--------------|-----|--------------------|
| A1              | Vbus - USB_A |     | 5V power           |
| A2              | DM - USB_A   |     | Data minus         |
| A3              | DP - USB_A   |     | Data plus          |
| A4              | GND          |     | Common ground      |
| B1              | Vbus - USB_A |     | 5V power           |
| B2              | DM - USB_A   |     | Data minus         |
| B3              | DP - USB_A   |     | Data plus          |
| B4              | GND          |     | Common ground      |
| Mechanical pins |              |     | Shield             |

#### 5.4.4 USB MicroAB

Figure 5-27. USB Host/Device MicroAB Connector J20

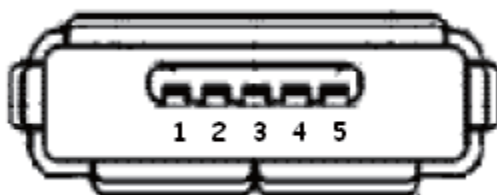


Table 5-7. USB Host/Device Micro AB Connector J20 Signal Descriptions

| Pin | Mnemonic | PIO | Signal Description       |
|-----|----------|-----|--------------------------|
| 1   | Vbus     |     | 5V power                 |
| 2   | DM       |     | Data minus               |
| 3   | DP       |     | Data plus                |
| 4   | ID       |     | On the Go identification |
| 5   | GND      |     | Common ground            |

#### 5.4.5 JTAG OB USB MicroAB

Figure 5-28. USB JTAG OB MicroAB connector J14

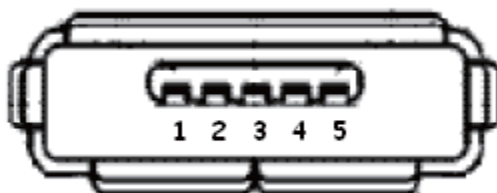


Table 5-8. USB JTAG OB MicroAB connector J14 Signal Descriptions

| Pin | Mnemonic | PIO | Signal description       |
|-----|----------|-----|--------------------------|
| 1   | Vbus     |     | 5V power                 |
| 2   | DM       |     | Data minus               |
| 3   | DP       |     | Data plus                |
| 4   | ID       |     | On the Go Identification |
| 5   | GND      |     | Common ground            |

5.4.6 HDMI Connector

Figure 5-29. HDMI Female Type A Connector J25

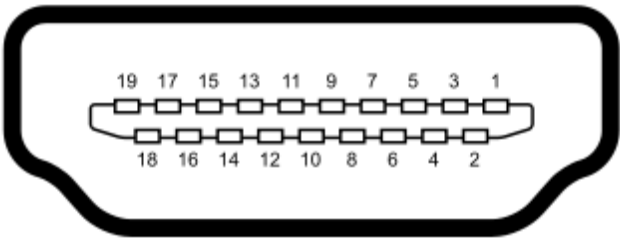


Table 5-9. HDMI Type A Female Connector J25

| LCD                | Pin Num |    | LCD                |
|--------------------|---------|----|--------------------|
| TMDS Data 2+       | 1       | 2  | TMDS Data 2 Shield |
| TMDS Data 2-       | 3       | 4  | TMDS Data 1+       |
| TMDS Data 1 Shield | 5       | 6  | TMDS Data 1-       |
| TMDS Data 0+       | 7       | 8  | TMDS Data 0 Shield |
| TMDS Data 0-       | 9       | 10 | TMDS Clock +       |
| TMDS Clock Shield  | 11      | 12 | TMDS Clock -       |
| NC                 | 13      | 14 | NC                 |
| SCL                | 15      | 16 | SDA                |
| GND                | 17      | 18 | +5V                |
| Hot Plus Detect    | 19      |    |                    |

5.4.7 RS232 Connector with RTS/CTS Handshake Support

Figure 5-30. USART1 Connector J8

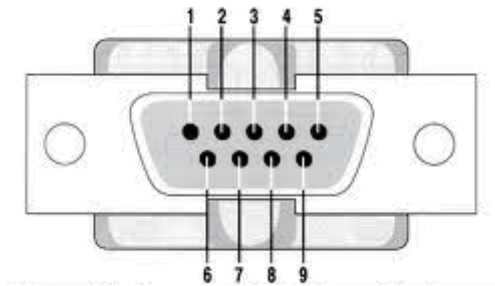
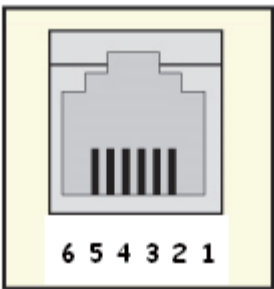


Table 5-10. USART Connector J8 Signal Descriptions

| Pin             | Mnemonic               | PIO  | Signal Description                  |
|-----------------|------------------------|------|-------------------------------------|
| 1, 4, 6, 9      |                        |      | No connection                       |
| 2               | RXD (Received Data)    | PB28 | RS232 serial data output signal     |
| 3               | TXD (Transmitted Data) | PB29 | RS232 serial data input signal      |
| 5               | GND                    |      | Common ground                       |
| 7               | RTS (Request To Send)  | PB27 | Active-positive RS232 input signal  |
| 8               | CTS (Clear To Send)    | PB26 | Active-positive RS232 output signal |
| Mechanical pins |                        |      | Shield                              |

5.4.8 DAA RJ11 Socket (6P4C)

Figure 5-31. DAA RJ11 Socket J16

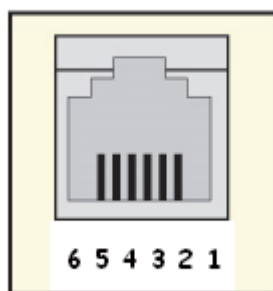


**Table 5-11. DAA RJ11 Socket J16 Signal Descriptions**

| Pin        | Mnemonic | Signal Description                   |
|------------|----------|--------------------------------------|
| 1, 2, 5, 6 |          | No connection                        |
| 3          | RAC      | RING side of ordinary telephone line |
| 4          | TAC      | TIP side of ordinary telephone line  |

#### 5.4.9 CAN RJ12 Socket (6P6C)

**Figure 5-32. CAN RJ12 Socket J18, J27**



**Table 5-12. CAN RJ12 Socket Signal Descriptions**

| Pin  | Mnemonic | Signal Description        |
|------|----------|---------------------------|
| 1    | 3V3      | Power pin                 |
| 2    | 5V       | Power pin                 |
| 4    | CANL     | CAN bus differential pair |
| 5    | CANH     | CAN bus differential pair |
| 3, 6 | GND      | Common ground             |

5.4.10 SD/MMC Plus MCI0

Figure 5-33. SD Socket J7

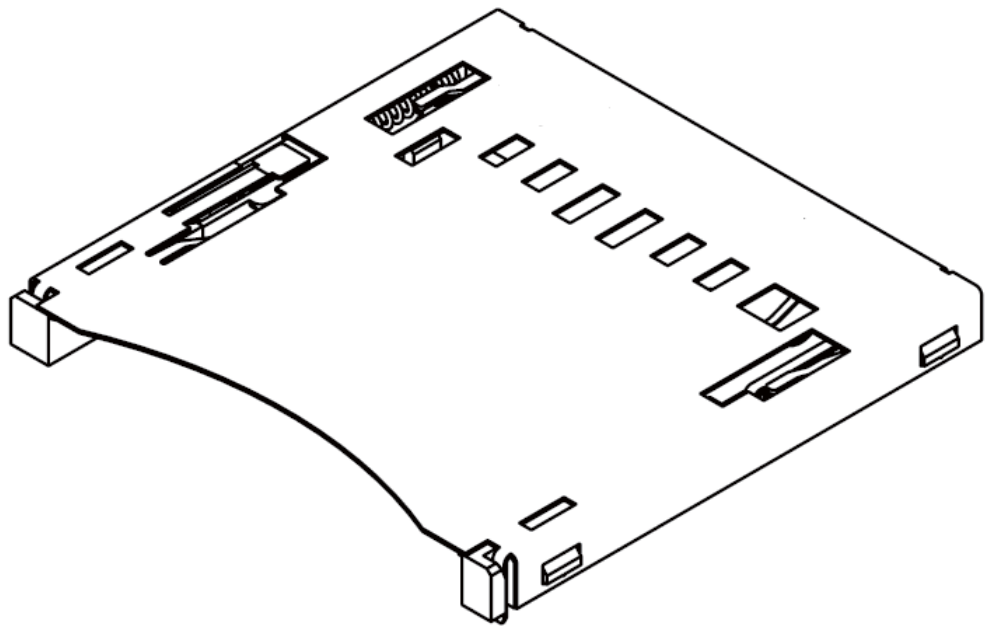


Table 5-13. MicroSD Socket J7 Signal Descriptions

| Pin | Mnemonic | PIO  | Signal Description   |
|-----|----------|------|----------------------|
| 1   | DAT3     | PD4  | Data bit             |
| 2   | CMD      | PD0  | Command line         |
| 3   | VSS      |      | Command line         |
| 4   | VCC      |      | Supply voltage 3.3V  |
| 5   | CLK      | PD9  | Clock / command line |
| 6   | CD       | PD17 | Card detect          |
| 7   | DAT0     | PD1  | Data bit             |
| 8   | DAT1     | PD2  | Data bit             |
| 9   | DAT2     | PD3  | Data bit             |
| 10  | DAT4     | PD5  | Data bit             |
| 11  | DAT5     | PD6  | Data bit             |
| 12  | DAT6     | PD7  | Data bit             |
| 13  | DAT7     | PD8  | Data bit             |
| 14  | WP       | JP6  | Protect              |
| 15  |          | VSS  | Common ground        |
| 16  |          | VSS  | Common ground        |

### 5.4.11 MicroSD MCI1

Figure 5-34. MicroSD Socket J6

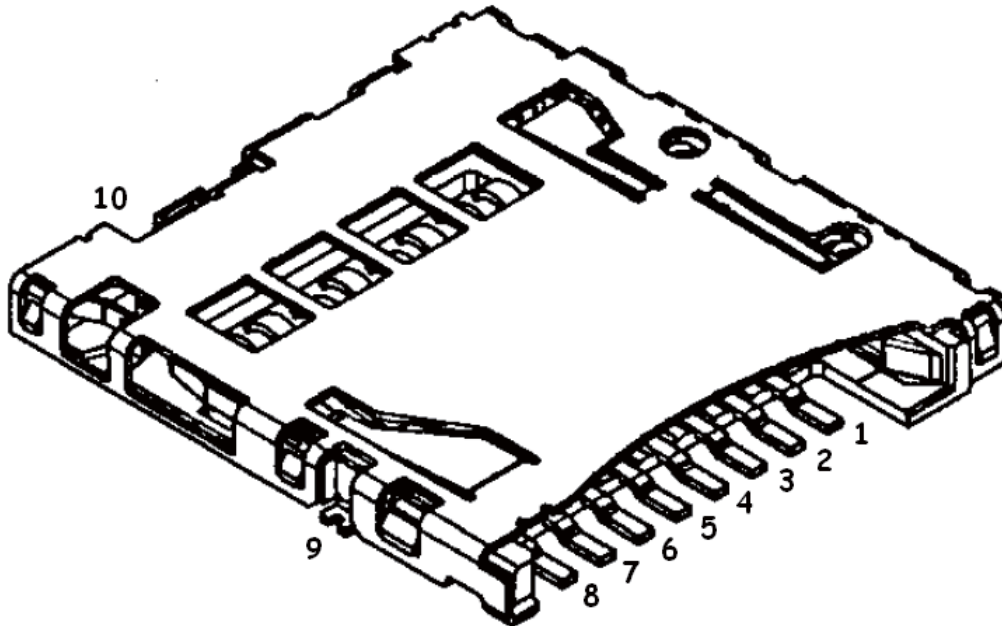
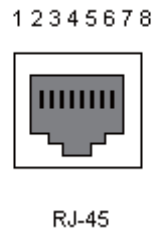


Table 5-14. MicroSD Socket J6 Signal Descriptions

| Pin | Mnemonic    | PIO  | Signal Description       |
|-----|-------------|------|--------------------------|
| 1   | DAT2        | PB22 | Data bit 2               |
| 2   | CD/DAT3     | PB23 | Card detect / data bit 3 |
| 3   | CMD         | PB19 | Command line             |
| 4   | VCC         |      | Supply voltage 3.3V      |
| 5   | CLK         | PB24 | Clock / command line     |
| 6   | VSS         |      | Common ground            |
| 7   | DAT0        | PB20 | Data bit 0               |
| 8   | DAT1        | PB21 | Data bit 1               |
| 9   | SW1         |      | Not used, grounded       |
| 10  | CARD DETECT | PD18 | Card detect              |

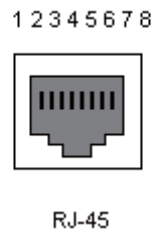
5.4.12 Gigabit Ethernet ETH0 RJ45 Socket J17

Figure 5-35. Gigabit Ethernet RJ45 Socket J17



5.4.13 Ethernet ETH1 RJ45 Socket J24

Figure 5-36. Ethernet RJ45 Socket J24



5.4.14 ZigBee Socket J10

Figure 5-37. ZigBee Socket J10

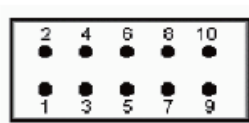


Table 5-15. ZigBee Socket J10 Signal Descriptions

| Function          | Signal Name | Port | Pin | Pin | Port | Signal Name | Function                                                                                                                | Option on Misc. Port Set by OR or Solder Shunts |
|-------------------|-------------|------|-----|-----|------|-------------|-------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------|
| Reset             | /RST        |      | 1   | 2   |      | Misc.       | EEPROM for MAC address, cap array settings and serial number<br>TST: test mode activation<br>CLKM: RF chip clock output |                                                 |
| Interrupt Request | IRQ         |      | 3   | 4   |      | SLP_TR      | SLP_TR                                                                                                                  |                                                 |
| SPI chip select   | /SEL        |      | 5   | 6   |      | MOSI        | SPI MOSI                                                                                                                |                                                 |
| SPI MISO          | MISO        |      | 7   | 8   |      | SCLK        | SPI CLK                                                                                                                 |                                                 |
| Power Supply      | GND         | GND  | 9   | 10  | VCC  | VCC         | VCC                                                                                                                     | Voltage range: 1.8V to 5.5V, regulated to 3.3V  |

### 5.4.15 LCD Socket J21

Figure 5-38. LCD Socket J21

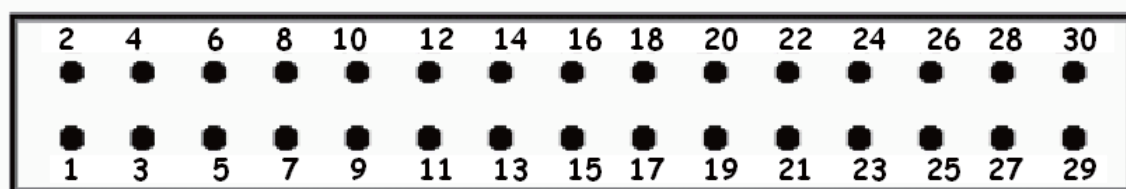


Table 5-16. LCD Socket J21 HE10 Female LCD 2\*15p

| LCD      | Pin Number |    | LCD      |
|----------|------------|----|----------|
| VDD3V3   | 1          | 2  | GND      |
| VDD3V3   | 3          | 4  | GND      |
| ZB_IRQ0  | 5          | 6  | ZB_IRQ1  |
| TWCK1    | 7          | 8  | TWD1     |
| GND      | 9          | 10 | LCDDAT15 |
| GND      | 11         | 12 | LCDDAT13 |
| GND      | 13         | 14 | LCDDAT14 |
| GND      | 15         | 16 | LCDDAT12 |
| GND      | 17         | 18 | LCDDAT0  |
| LCDDAT1  | 19         | 20 | LCDDAT2  |
| LCDDAT3  | 21         | 22 | LCDDAT4  |
| LCDDAT5  | 23         | 24 | LCDDAT6  |
| LCDDAT7  | 25         | 26 | LCDDAT8  |
| LCDDAT9  | 27         | 28 | LCDDAT10 |
| LCDDAT11 | 29         | 30 | GND      |

## 5.4.16 LCD/TSC Socket J22

Figure 5-39. LCD/TSC Socket J22

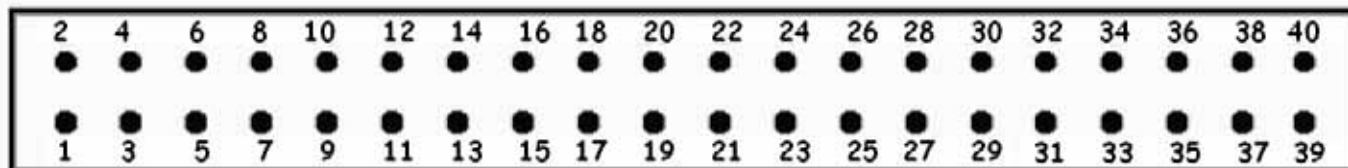


Table 5-17. LCD/TSC Socket J22 HE10 Female LCD/TSC/QT 2\*20p

| LCD       |        | Pin Number |    | LCD        |             |
|-----------|--------|------------|----|------------|-------------|
| 5V        | 5V_LCD | 1          | 2  | GND        | GND         |
| 5V        | 5V_LCD | 3          | 4  | GND        | GND         |
| LCDDAT16  |        | 5          | 6  |            | LCDDAT17    |
| LCDDAT18  |        | 7          | 8  |            | LCDDAT19    |
| LCDDAT20  |        | 9          | 10 |            | LCDDAT21    |
| LCDDAT22  |        | 11         | 12 |            | LCDDAT23    |
| GND       | GND    | 13         | 14 | GND        | GND         |
| LCDDISP   |        | 15         | 16 |            | LCDPWM      |
| LCDCSYNC  |        | 17         | 18 |            | LCDHSYNC    |
| LCDDEN    |        | 19         | 20 |            | LCDPCK      |
| GND       | GND    | 21         | 22 | GND        | GND         |
| AD0_XP    | TSC    | 23         | 24 | TSC        | AD1_XM      |
| AD2_YP    | TSC    | 25         | 26 | TSC        | AD3_YM      |
| AD4_LR    | TSC    | 27         | 28 |            | ONE_WIRE    |
| GND1      | GND    | 29         | 30 | GND        | GND         |
| SPI1_MISO |        | 31         | 32 |            | SPI1_MOSI   |
| SPI1_SPCK |        | 33         | 34 |            | SPI1_NPCS3  |
| EN_PWRLCD |        | 35         | 36 | LCD_DETECT | LCD_DETECT# |
|           | PB14   | 37         | 38 | PB15       |             |
| GND       | GND    | 39         | 40 | GND        | GND         |

### 5.4.17 ISI Socket J11

Figure 5-40. ISI Socket J11

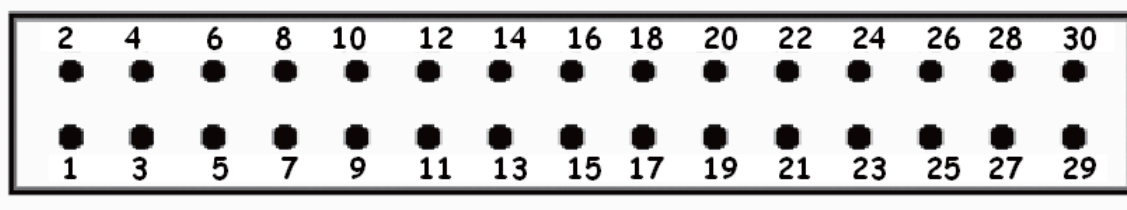


Table 5-18. ISI Socket J11 HE10 Female ISI 2\*15p

| ISI      | Pin Number |    | ISI        |
|----------|------------|----|------------|
| VDDISI   | 1          | 2  | GND        |
| VDDISI   | 3          | 4  | GND        |
| ZB_SLPTR | 5          | 6  | ZB_RST     |
| TWCK1    | 7          | 8  | TWD1       |
| GND      | 9          | 10 | ISI_MCK    |
| GND      | 11         | 12 | ISI_VSYNC  |
| GND      | 13         | 14 | ISDI_HSYNC |
| GND      | 15         | 16 | ISI_PCK    |
| GND      | 17         | 18 | ISI_D0     |
| ISI_D1   | 19         | 20 | ISI_D2     |
| ISI_D3   | 21         | 22 | ISI_D4     |
| ISI_D5   | 23         | 24 | ISI_D6     |
| ISI_D7   | 25         | 26 | ISI_D8     |
| ISI_D9   | 27         | 28 | ISI_D10    |
| ISI_D11  | 29         | 30 | GND        |

## 5.4.18 PIO Usage

**Table 5-19. PIO A Pin Assignment and Signal Description**

| Power Rail | Signal | Signal   | Signal | Signal    | SAMA5-CM | SAMA5-MB  |
|------------|--------|----------|--------|-----------|----------|-----------|
| VDDIOP0    | PA0    | LCDDAT0  | PIO    | PU        | –        | LCDDAT0   |
| VDDIOP0    | PA1    | LCDDAT1  | PIO    | PU        | –        | LCDDAT1   |
| VDDIOP0    | PA2    | LCDDAT2  | PIO    | PU        | –        | LCDDAT2   |
| VDDIOP0    | PA3    | LCDDAT3  | PIO    | PU        | –        | LCDDAT3   |
| VDDIOP0    | PA4    | LCDDAT4  | PIO    | PU        | –        | LCDDAT4   |
| VDDIOP0    | PA5    | LCDDAT5  | PIO    | PU        | –        | LCDDAT5   |
| VDDIOP0    | PA6    | LCDDAT6  | PIO    | PU        | –        | LCDDAT6   |
| VDDIOP0    | PA7    | LCDDAT7  | PIO    | PU        | –        | LCDDAT7   |
| VDDIOP0    | PA8    | LCDDAT8  | PIO    | PU        | –        | LCDDAT8   |
| VDDIOP0    | PA9    | LCDDAT9  | PIO    | PU        | –        | LCDDAT9   |
| VDDIOP0    | PA10   | LCDDAT10 | PIO    | PU        | –        | LCDDAT10  |
| VDDIOP0    | PA11   | LCDDAT11 | PIO    | PU        | –        | LCDDAT11  |
| VDDIOP0    | PA12   | LCDDAT12 | PIO    | PU        | –        | LCDDAT12  |
| VDDIOP0    | PA13   | LCDDAT13 | PIO    | PU        | –        | LCDDAT13  |
| VDDIOP0    | PA14   | LCDDAT14 | PIO    | PU        | –        | LCDDAT14  |
| VDDIOP0    | PA15   | LCDDAT15 | PIO    | PU        | –        | LCDDAT15  |
| VDDIOP0    | PA16   | LCDDAT16 | ISI_D0 | PIO       | –        | ISI_D0    |
| VDDIOP0    | PA17   | LCDDAT17 | ISI_D1 | PIO       | –        | ISI_D1    |
| VDDIOP0    | PA18   | LCDDAT18 | TWD2   | ISI_D2    | –        | ISI_D2    |
| VDDIOP0    | PA19   | LCDDAT19 | TWCK2  | ISI_D3    | –        | ISI_D3    |
| VDDIOP0    | PA20   | LCDDAT20 | PWMH0  | ISI_D4    | –        | ISI_D4    |
| VDDIOP0    | PA21   | LCDDAT21 | PWML0  | ISI_D5    | –        | ISI_D5    |
| VDDIOP0    | PA22   | LCDDAT22 | PWMH1  | ISI_D6    | –        | ISI_D6    |
| VDDIOP0    | PA23   | LCDDAT23 | PWML1  | ISI_D7    | –        | ISI_D7    |
| VDDIOP0    | PA24   | LCDPWM   | PIO    | PU        | –        | LCDPWM    |
| VDDIOP0    | PA25   | LCDDISP  | PIO    | PU        | –        | LCDDISP   |
| VDDIOP0    | PA26   | LCDVSYNC | PIO    | PU        | –        | LCDVSYNC  |
| VDDIOP0    | PA27   | LCDHSYNC | PIO    | PU        | –        | LCDHSYNC  |
| VDDIOP0    | PA28   | LCDPCK   | PIO    | PU        | –        | LCDPCK    |
| VDDIOP0    | PA29   | LCDDEN   | PIO    | PU        | –        | LCDDEN    |
| VDDIOP0    | PA30   | TWD0     | URXD1  | ISI_VSYNC | –        | ISI_VSYNC |
| VDDIOP0    | PA31   | TWCK0    | UTXD1  | ISI_HSYNC | –        | ISI_HSYNC |

**Table 5-20. PIO B Pin Assignment and Signal Description**

| Power Rail | Signal | Signal   | Signal | Signal | SAMA5-CM  | SAMA5-MB        |
|------------|--------|----------|--------|--------|-----------|-----------------|
| VDDIOP1    | PB0    | GTX0     | PWMH0  | PIO    | GETH CM   | –               |
| VDDIOP1    | PB1    | GTX1     | PWML0  | PIO    | GETH CM   | –               |
| VDDIOP1    | PB2    | GTX2     | TK1    | PIO    | GETH CM   | –               |
| VDDIOP1    | PB3    | GTX3     | TF1    | PIO    | GETH CM   | –               |
| VDDIOP1    | PB4    | GRX0     | PWMH1  | PIO    | GETH CM   | –               |
| VDDIOP1    | PB5    | GRX1     | PWML1  | PIO    | GETH CM   | –               |
| VDDIOP1    | PB6    | GRX2     | TD1    | PIO    | GETH CM   | –               |
| VDDIOP1    | PB7    | GRX3     | RK1    | PIO    | GETH CM   | –               |
| VDDIOP1    | PB8    | GTXCK    | PWMH2  | PIO    | GETH CM   | –               |
| VDDIOP1    | PB9    | GTXEN    | PWML2  | PIO    | GETH CM   | –               |
| VDDIOP1    | PB10   | GTXER    | RF1    | PIO    | –         | PWR_MCI0        |
| VDDIOP1    | PB11   | GRXCK    | RD1    | PIO    | GETH CM   | –               |
| VDDIOP1    | PB12   | GRXDV    | PWMH3  | PIO    | –         | PWR_MCI1        |
| VDDIOP1    | PB13   | GRXER    | PWML3  | PIO    | GETH CM   | RX_DV (KSZ9021) |
| VDDIOP1    | PB14   | GCRS     | CANRX1 | PIO    | –         | CANRX1          |
| VDDIOP1    | PB15   | GCOL     | CANTX1 | PIO    | –         | CANTX1          |
| VDDIOP1    | PB16   | GMDC     | PIO    | PU     | GETH CM   | –               |
| VDDIOP1    | PB17   | GMDIO    | PIO    | PU     | GETH CM   | –               |
| VDDIOP1    | PB18   | G125CK   | PIO    | PU     | GETH CM   | –               |
| VDDIOP1    | PB19   | MCI1_CDA | GTX4   | PIO    | –         | MCI1_CDA        |
| VDDIOP1    | PB20   | MCI1_DA0 | GTX5   | PIO    | –         | MCI1_DA0        |
| VDDIOP1    | PB21   | MCI1_DA1 | GTX6   | PIO    | –         | MCI1_DA1        |
| VDDIOP1    | PB22   | MCI1_DA2 | GTX7   | PIO    | –         | MCI1_DA2        |
| VDDIOP1    | PB23   | MCI1_DA3 | GRX4   | PIO    | –         | MCI1_DA3        |
| VDDIOP1    | PB24   | MCI1_CK  | GRX5   | PIO    | –         | MCI1_CK         |
| VDDIOP1    | PB25   | SCK1     | GRX6   | PIO    | INT_GETH0 | –               |
| VDDIOP1    | PB26   | CTS1     | GRX7   | PIO    | –         | CTS1            |
| VDDIOP1    | PB27   | RTS1     | PWMH1  | PIO    | –         | RTS1            |
| VDDIOP1    | PB28   | RXD1     | PIO    | PU     | –         | RXD1            |
| VDDIOP1    | PB29   | TXD1     | PIO    | PU     | –         | TXD1            |
| VDDIOP0    | PB30   | DRXD     | PIO    | PU     | –         | DRXD (DBGU)     |
| VDDIOP0    | PB31   | DTXD     | PIO    | PU     | –         | DTXD (DBGU)     |

**Table 5-21. PIO C Pin Assignment and Signal Description**

| Power Rail | Signal | Signal     | Signal   | Signal   | SAMA5-MB   |            |
|------------|--------|------------|----------|----------|------------|------------|
| VDDIOP0    | PC0    | ETX0       | TIOA3    | PIO      | ETX0       | –          |
| VDDIOP0    | PC1    | ETX1       | TIOB3    | PIO      | ETX1       | –          |
| VDDIOP0    | PC2    | ERX0       | TCLK3    | PIO      | ERX0       | –          |
| VDDIOP0    | PC3    | ERX1       | TIOA4    | PIO      | ERX1       | –          |
| VDDIOP0    | PC4    | ETXEN      | TIOB4    | PIO      | ETXEN      | –          |
| VDDIOP0    | PC5    | ECRSDV     | TCLK4    | PIO      | ECRSDV     | –          |
| VDDIOP0    | PC6    | ERXER      | TIOA5    | PIO      | ERXER      | –          |
| VDDIOP0    | PC7    | EREFCK     | TIOB5    | PIO      | EREFCK     | –          |
| VDDIOP0    | PC8    | EMDC       | TCLK5    | PIO      | EMDC       | –          |
| VDDIOP0    | PC9    | EMDIO      | PIO      | PU       | EMDIO      | –          |
| VDDIOP0    | PC10   | MCI2_CDA   | LCDDAT20 | PIO      | LCDDAT20   | –          |
| VDDIOP0    | PC11   | MCI2_DA0   | LCDDAT19 | PIO      | LCDDAT19   | –          |
| VDDIOP0    | PC12   | MCI2_DA1   | TIOA1    | LCDDAT18 | LCDDAT18   | –          |
| VDDIOP0    | PC13   | MCI2_DA2   | TIOB1    | LCDDAT17 | LCDDAT17   | –          |
| VDDIOP0    | PC14   | MCI2_DA3   | TCLK1    | LCDDAT16 | LCDDAT16   | –          |
| VDDIOP0    | PC15   | MCI2_CK    | PCK2     | LCDDAT21 | LCDDAT21   | ISI_MCK    |
| VDDIOP0    | PC16   | TK0        | PIO      | PU       | TK0 Audio  | –          |
| VDDIOP0    | PC17   | TF0        | PIO      | PU       | TF0 Audio  | –          |
| VDDIOP0    | PC18   | TD0        | PIO      | PU       | TD0 Audio  | –          |
| VDDIOP0    | PC19   | RK0        | PIO      | PU       | RK0 Audio  | –          |
| VDDIOP0    | PC20   | RF0        | PIO      | PU       | RF0 Audio  | –          |
| VDDIOP0    | PC21   | RD0        | PIO      | PU       | RD0 Audio  | –          |
| VDDIOP0    | PC22   | SPI1_MISO  | PIO      | PU       | SPI1_MISO  | SPI LCD    |
| VDDIOP0    | PC23   | SPI1_MOSI  | PIO      | PU       | SPI1_MOSI  | SPI LCD    |
| VDDIOP0    | PC24   | SPI1_SPCK  | PIO      | PU       | SPI1_SPCK  | SPI LCD    |
| VDDIOP0    | PC25   | SPI1_NPCS0 | PIO      | PU       | SPI1_NPCS0 | –          |
| VDDIOP0    | PC26   | SPI1_NPCS1 | TWD1     | ISI_D11  | ISI_D11    | TWI LCD    |
| VDDIOP0    | PC27   | SPI1_NPCS2 | TWCK1    | ISI_D10  | ISI_D10    | TWI LCD    |
| VDDIOP0    | PC28   | SPI1_NPCS3 | PWMFI0   | ISI_D9   | ISI_D9     | SPI LCD    |
| VDDIOP0    | PC29   | URXD0      | PWMFI2   | ISI_D8   | ISI_D8     | HDMI_INT   |
| VDDIOP0    | PC30   | UTXD0      | ISI_PCK  | PIO      | ISI_PCK    | –          |
| VDDIOP0    | PC31   | FIQ        | PWMFI1   | PIO      | –          | Reset_HDMI |

**Table 5-22. PIO D Pin Assignment and Signal Description**

| Power Rail | Signal | Signal     | Signal     | Signal | SAMA5-MB    |               |
|------------|--------|------------|------------|--------|-------------|---------------|
| VDDIOP1    | PD0    | MCI0_CDA   | PIO        | PU     | –           | MCI0_CDA      |
| VDDIOP1    | PD1    | MCI0_DA0   | PIO        | PU     | –           | MCI0_DA0      |
| VDDIOP1    | PD2    | MCI0_DA1   | PIO        | PU     | –           | MCI0_DA1      |
| VDDIOP1    | PD3    | MCI0_DA2   | PIO        | PU     | –           | MCI0_DA2      |
| VDDIOP1    | PD4    | MCI0_DA3   | PIO        | PU     | –           | MCI0_DA3      |
| VDDIOP1    | PD5    | MCI0_DA4   | TIOA0      | PWMH2  | –           | MCI0_DA4      |
| VDDIOP1    | PD6    | MCI0_DA5   | TIOB0      | PWML2  | –           | MCI0_DA5      |
| VDDIOP1    | PD7    | MCI0_DA6   | TCLK0      | PWMH3  | –           | MCI0_DA6      |
| VDDIOP1    | PD8    | MCI0_DA7   | PWML3      | PIO    | –           | MCI0_DA7      |
| VDDIOP1    | PD9    | MCI0_CK    | PIO        | PU     | –           | MCI0_CK       |
| VDDIOP1    | PD10   | SPI0_MISO  | PIO        | PU     | CM_SerFlash | –             |
| VDDIOP1    | PD11   | SPI0_MOSI  | PIO        | PU     | CM_SerFlash | –             |
| VDDIOP1    | PD12   | SPI0_SPCK  | PIO        | PU     | CM_SerFlash | –             |
| VDDIOP1    | PD13   | SPI0_NPCS0 | PIO        | PU     | CM_SerFlash | –             |
| VDDIOP1    | PD14   | SCK0       | SPI0_NPCS1 | CANRX0 | –           | CANRX0        |
| VDDIOP1    | PD15   | CTS0       | SPI0_NPCS2 | CANTX0 | –           | CANTX0        |
| VDDIOP1    | PD16   | RTS0       | SPI0_NPCS3 | PWMFI3 | INT_AUDIO   | –             |
| VDDIOP1    | PD17   | RXD0       | PIO        | PU     | –           | MCI0_CD       |
| VDDIOP1    | PD18   | TXD0       | PIO        | PU     | –           | MCI1_CD       |
| VDDIOP1    | PD19   | ADTRG      | PIO        | PU     | –           | ADTRG (HSYNC) |
| VDDANA     | PD20   | AD0        | PIO        | PU     | –           | LCD TSC       |
| VDDANA     | PD21   | AD1        | PIO        | PU     | –           | LCD TSC       |
| VDDANA     | PD22   | AD2        | PIO        | PU     | –           | LCD TSC       |
| VDDANA     | PD23   | AD3        | PIO        | PU     | –           | LCD TSC       |
| VDDANA     | PD24   | AD4        | PIO        | PU     | –           | LCD TSC       |
| VDDANA     | PD25   | AD5        | PIO        | PU     | –           | EN5V_USBA     |
| VDDANA     | PD26   | AD6        | PIO        | PU     | –           | EN5V_USBB     |
| VDDANA     | PD27   | AD7        | PIO        | PU     | –           | EN5V_USBC     |
| VDDANA     | PD28   | AD8        | PIO        | PU     | –           | OVCUR_USB     |
| VDDANA     | PD29   | AD9        | PIO        | PU     | –           | VBUS_SENSE    |
| VDDANA     | PD30   | AD10       | PCK0       | PIO    | MCLK_AUDIO  | MCLK_HDMI     |
| VDDANA     | PD31   | AD11       | PCK1       | PIO    | –           | ISI_MCK       |

**Table 5-23. PIO E Pin Assignment and Signal Description**

| Power Rail | Signal | Signal      | Signal | SAMA5-CM          | SAMA5-MB |          |
|------------|--------|-------------|--------|-------------------|----------|----------|
| VDDIOM     | PE0    | A0/NBS0     | I      |                   | –        | –        |
| VDDIOM     | PE1    | A1          | I      | NOR               | –        | –        |
| VDDIOM     | PE2    | A2          | I      | NOR               | –        | –        |
| VDDIOM     | PE3    | A3          | I      | NOR               | –        | –        |
| VDDIOM     | PE4    | A4          | I      | NOR               | –        | –        |
| VDDIOM     | PE5    | A5          | I      | NOR               | –        | –        |
| VDDIOM     | PE6    | A6          | I      | NOR               | –        | –        |
| VDDIOM     | PE7    | A7          | I      | NOR               | –        | –        |
| VDDIOM     | PE8    | A8          | I      | NOR               | –        | –        |
| VDDIOM     | PE9    | A9          | I      | NOR               | –        | –        |
| VDDIOM     | PE10   | A10         | I      | NOR               | –        | –        |
| VDDIOM     | PE11   | A11         | I      | NOR               | –        | –        |
| VDDIOM     | PE12   | A12         | I      | NOR               | –        | –        |
| VDDIOM     | PE13   | A13         | I      | NOR               | –        | –        |
| VDDIOM     | PE14   | A14         | I      | NOR               | –        | –        |
| VDDIOM     | PE15   | A15         | SCK3   | NOR               | –        | –        |
| VDDIOM     | PE16   | A16         | CTS3   | NOR               | –        | –        |
| VDDIOM     | PE17   | A17         | RTS3   | NOR               | –        | –        |
| VDDIOM     | PE18   | A18         | RXD3   | NOR               | –        | –        |
| VDDIOM     | PE19   | A19         | TXD3   | NOR               | –        | –        |
| VDDIOM     | PE20   | A20         | SCK2   | NOR               | –        | –        |
| VDDIOM     | PE21   | A21/NANDALE | I      | NOR / NAND        | –        | –        |
| VDDIOM     | PE22   | A22/NANDCLE | I      | NOR / NAND        | –        | –        |
| VDDIOM     | PE23   | A23         | CTS2   | NOR               | –        | –        |
| VDDIOM     | PE24   | A24         | RTS2   | Power LED         | ISI_RST  | –        |
| VDDIOM     | PE25   | A25         | RXD2   | 1-Wire / User LED | 1-Wire   | –        |
| VDDIOM     | PE26   | NCS0        | TXD2   | CS NOR            | –        | –        |
| VDDIOM     | PE27   | NCS1        | TIOA2  | –                 | PB_USER1 | LCDDAT22 |
| VDDIOM     | PE28   | NCS2        | TIOB2  | –                 | ZB_SLPTR | LCDDAT23 |
| VDDIOM     | PE29   | NWR1/NBS1   | TCLK2  | –                 | ZB_RST   | –        |
| VDDIOM     | PE30   | NWAIT       | I      | –                 | ZB_IRQ1  | INT_ETH1 |
| VDDIOM     | PE31   | IRQ         | PWML1  | –                 | ZB_IRQ0  | HDMI_INT |

## 5.4.19 IO Expansion Port J1

Figure 5-41. IO Expansion Socket J1

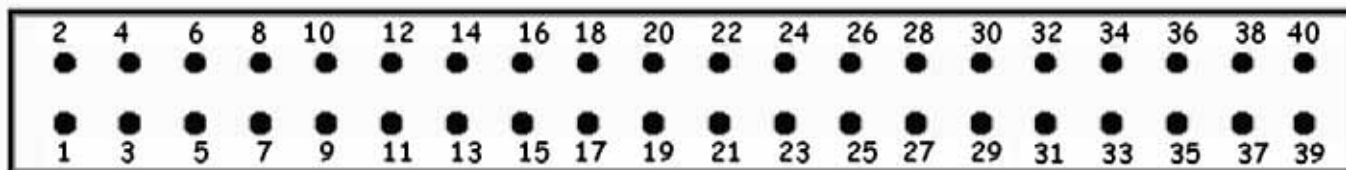


Table 5-24. IO Expansion Socket J1 HE10 Male 2\*20 Signal Descriptions

| Signal       | Pin Number |    | Signal       |
|--------------|------------|----|--------------|
| VDDIOP0 / 5V | 1          | 2  | VDDIOP0 / 5V |
| GND          | 3          | 4  | GND          |
| PA0          | 5          | 6  | PA16         |
| PA1          | 7          | 8  | PA17         |
| PA2          | 9          | 10 | PA18         |
| PA3          | 11         | 12 | PA19         |
| PA4          | 13         | 14 | PA20         |
| PA5          | 15         | 16 | PA21         |
| PA6          | 17         | 18 | PA22         |
| PA7          | 19         | 20 | PA23         |
| PA8          | 21         | 22 | PA24         |
| PA9          | 23         | 24 | PA25         |
| PA10         | 25         | 26 | PA26         |
| PA11         | 27         | 28 | PA27         |
| PA12         | 29         | 30 | PA28         |
| PA13         | 31         | 32 | PA29         |
| PA14         | 33         | 34 | PA30         |
| PA15         | 35         | 36 | PA31         |
| GND          | 37         | 38 | GND          |
| VDDIOP0      | 39         | 40 | VDDIOP0      |

## 5.4.20 IO Expansion Port J2

Figure 5-42. IO Expansion Socket J2

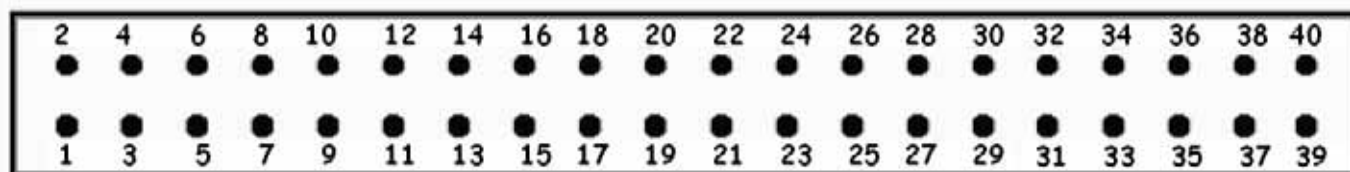


Table 5-25. Expansion Socket J2 HE10 Male 2\*20 Signal Descriptions

| Signal       | Pin Number |    | Signal       |
|--------------|------------|----|--------------|
| VDDIOP0 / 5V | 1          | 2  | VDDIOP0 / 5V |
| GND          | 3          | 4  | GND          |
| PC0          | 5          | 6  | PC16         |
| PC1          | 7          | 8  | PC17         |
| PC2          | 9          | 10 | PC18         |
| PC3          | 11         | 12 | PC19         |
| PC4          | 13         | 14 | PC20         |
| PC5          | 15         | 16 | PC21         |
| PC6          | 17         | 18 | PC22         |
| PC7          | 19         | 20 | PC23         |
| PC8          | 21         | 22 | PC24         |
| PC9          | 23         | 24 | PC25         |
| PC10         | 25         | 26 | PC26         |
| PC11         | 27         | 28 | PC27         |
| PC12         | 29         | 30 | PC28         |
| PC13         | 31         | 32 | PC29         |
| PC14         | 33         | 34 | PC30         |
| PC15         | 35         | 36 | PC31         |
| GND          | 37         | 38 | GND          |
| VDDIOP0      | 39         | 40 | VDDIOP0      |

## 5.4.21 IO Expansion Port J3

Figure 5-43. IO Expansion Socket J3

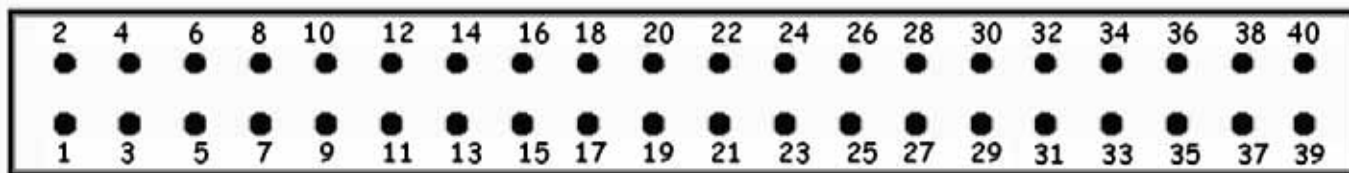


Table 5-26. Expansion Socket J3 HE10 Male 2\*20 Signal Descriptions

| Signal       | Pin Number |    | Signal       |
|--------------|------------|----|--------------|
| VDDIOP0 / 5V | 1          | 2  | VDDIOP0 / 5V |
| GND          | 3          | 4  | GND          |
| PB10         | 5          | 6  | PB31         |
| PB12         | 7          | 8  | PE23         |
| PB14         | 9          | 10 | PE24         |
| PB15         | 11         | 12 | PE25         |
| PB19         | 13         | 14 | PE26         |
| PB20         | 15         | 16 | PE29         |
| PB21         | 17         | 18 | PE30         |
| PB22         | 19         | 20 | PE31         |
| PB23         | 21         | 22 | PD10         |
| PB24         | 23         | 24 | PD11         |
| PB25         | 25         | 26 | PD12         |
| PB26         | 27         | 28 | PD13         |
| PB27         | 29         | 30 | PD14         |
| PB28         | 31         | 32 | PD15         |
| PB29         | 33         | 34 | PD19         |
| PB30         | 35         | 36 | PD31         |
| GND          | 37         | 38 | GND          |
| VDDIOP0      | 39         | 40 | VDDIOP0      |

#### 5.4.22 SODIMM Card Edge Socket

The SAMA5D3 series-EK implements a SODIMM200 standard connector for to interface to the CM board.

Note this is not an industry standard pinout and is unlikely to be compatible with off-the-shelf SODIMM.

**Figure 5-44. SODIMM200 Socket CON1**



**Table 5-27. SODIMM200 CON1 Signal Descriptions**

| PIOC     | PIOB         | PIOA       |            | SODIMM 200 |    |           | PIOA            | PIOB     | PIOC     |
|----------|--------------|------------|------------|------------|----|-----------|-----------------|----------|----------|
|          |              |            | Front Side | A          | B  | Back Side |                 |          |          |
| —        | —            | VCC 5V     |            | 1          | 2  | VCC 5V    |                 | —        | —        |
| —        | —            | VCC 5V     |            | 3          | 4  | VCC 5V    |                 | —        | —        |
| —        | —            | GND        |            | 5          | 6  | VBAT      |                 | —        | —        |
| —        | —            | CTS2       | PE23       | 7          | 8  | PE29      | NWR1/NBS1       | TCLK2    | —        |
| —        | —            | RTS2       | PE24       | 9          | 10 | PE30      | NWAIT           | —        | —        |
| —        | —            | RXD2       | PE25       | 11         | 12 | PE31      | IRQ             | PWML1    | —        |
| —        | —            | TXD2       | PE26       | 13         | 14 | —         | —               | GND      | —        |
| —        | —            | VDDIOM     |            | 15         | 16 | VDDIOM    |                 | —        | —        |
| —        | —            | SPI1_NPCS0 | PC25       | 17         | 18 | PC24      | SPI1_SPCK       | —        | —        |
| —        | —            | SPI1_MOSI  | PC23       | 19         | 20 | PC22      | SPI1_MISO       | —        | —        |
| —        | —            | RD0        | PC21       | 21         | 22 | PC20      | RF0             | —        | —        |
| —        | —            | GND        |            | 23         | 24 | PC19      | RK0             | —        | —        |
| —        | —            | TD0        | PC18       | 25         | 26 | PC17      | TF0             | —        | —        |
| —        | —            | TK0        | PC16       | 27         | 28 | PC9       | EMDIO           | PIO      | —        |
| —        | TCLK5        | EMDC       | PC8        | 29         | 30 | PC7       | EREFC           | TIOB5    | —        |
| —        | TIOA5        | ERXER      | PC6        | 31         | 32 | —         | —               | GND      | —        |
| —        | TIOB4        | ETXEN      | PC4        | 33         | 34 | PC5       | ECRSDV          | TCLK4    | —        |
| —        | TCLK3        | ERX0       | PC2        | 35         | 36 | PC3       | ERX1            | TIOA4    | —        |
| —        | TIOA3        | ETX0       | PC0        | 37         | 38 | PC1       | ETX1            | TIOB3    | —        |
| —        | Power Enable |            | Enable_0   | 39         | 40 | Enable_1  | CS Boot Disable |          | —        |
|          |              |            |            | KEY        |    |           |                 |          |          |
| —        | —            | VCC 3V3    |            | 41         | 42 | VCC 3V3   |                 | —        | —        |
| —        | —            | VCC 3V3    |            | 43         | 44 | VCC 3V3   |                 | —        | —        |
| —        | —            | NC         | Enable_2   | 45         | 46 | Enable_3  | NC              | —        | —        |
| —        | —            | NC         | —          | 47         | 48 |           | ADVREF          | —        | —        |
| LCDDAT22 | TIOA2        | NCS1       | PE27       | 49         | 50 | PE28      | NCS2            | TIOB2    | LCDDAT23 |
| —        | LCDDAT20     | MCI2_CDA   | PC10       | 51         | 52 | PC11      | MCI2_DA0        | LCDDAT19 | PIO      |
| —        | —            | GND        | —          | 53         | 54 | PC13      | MCI2_DA2        | TIOB1    | LCDDAT17 |
| LCDDAT18 | TIOA1        | MCI2_DA1   | PC12       | 55         | 56 | PC15      | MCI2_CK         | PCK2     | LCDDAT21 |
| LCDDAT16 | TCLK1        | MCI2_DA3   | PC14       | 57         | 58 | PC26      | SPI1_NPCS1      | —        | ISI_D11  |
| ISI_D10  | —            | SPI1_NPCS2 | PC27       | 59         | 60 | PC28      | SPI1_NPCS3      | PWMFI0   | ISI_D9   |
| ISI_D8   | PWMFI2       | URXD0      | PC29       | 61         | 62 | —         | GND             | —        | —        |
| —        | PWMFI1       | FIQ        | PC31       | 63         | 64 | PC30      | UTXD0           | ISI_PCK  | —        |
| VDDIOP0  |              |            |            | 65         | 66 | VDDIOP0   |                 |          |          |
| —        | —            | LCDDAT0    | PA0        | 67         | 68 | PA1       | LCDDAT1         | —        | —        |

Table 5-27. SODIMM200 CON1 Signal Descriptions

| PIOC      | PIOB       | PIOA      |      | SODIMM 200 |     |         | PIOA       | PIOB       | PIOC      |
|-----------|------------|-----------|------|------------|-----|---------|------------|------------|-----------|
| —         | —          | LCDDAT2   | PA2  | 69         | 70  | PA3     | LCDDAT3    | —          | —         |
| —         | —          | GND       | —    | 71         | 72  | PA4     | LCDDAT4    | —          | —         |
| —         | —          | LCDDAT5   | PA5  | 73         | 74  | PA6     | LCDDAT6    | —          | —         |
| —         | —          | LCDDAT7   | PA7  | 75         | 76  | PA8     | LCDDAT8    | —          | —         |
| —         | —          | LCDDAT9   | PA9  | 77         | 78  | PA10    | LCDDAT10   | —          | —         |
| —         | —          | LCDDAT11  | PA11 | 79         | 80  |         | GND        | —          | —         |
| —         | —          | LCDDAT12  | PA12 | 81         | 82  | PA13    | LCDDAT13   | —          | —         |
| —         | —          | LCDDAT14  | PA14 | 83         | 84  | PA15    | LCDDAT15   | —          | —         |
| —         | ISI_D0     | LCDDAT16  | PA16 | 85         | 86  | PA17    | LCDDAT17   | ISI_D1     | —         |
| ISI_D2    | TWD2       | LCDDAT18  | PA18 | 87         | 88  | PA19    | LCDDAT19   | TWCK2      | ISI_D3    |
| —         | —          | GND       | —    | 89         | 90  | PA20    | LCDDAT20   | PWMH0      | ISI_D4    |
| ISI_D5    | PWML0      | LCDDAT21  | PA21 | 91         | 92  | PA22    | LCDDAT22   | PWMH1      | ISI_D6    |
| ISI_D7    | PWML1      | LCDDAT23  | PA23 | 93         | 94  | PA24    | LCDPWM     | —          | —         |
| —         | —          | LCDDISP   | PA25 | 95         | 96  | PA26    | LCDVSYNC   | —          | —         |
| —         | —          | LCDHSYNC  | PA27 | 97         | 98  |         | GND        | —          | —         |
| —         | —          | LCDPCK    | PA28 | 99         | 100 | PA29    | LCDDEN     | —          | —         |
| ISI_VSYNC | URXD1      | TWD0      | PA30 | 101        | 102 | PA31    | TWCK0      | UTXD1      | ISI_HSYNC |
| VDDANA    |            |           |      | 103        | 104 | VDDANA  |            |            |           |
| —         | PCK0       | AD10      | PD30 | 105        | 106 | PD31    | AD11       | PCK1       | —         |
| —         | —          | GND       | —    | 107        | 108 | PD29    | AD9        | —          | —         |
| —         | —          | AD8       | PD28 | 109        | 110 | PD27    | AD7        | —          | —         |
| —         | —          | AD6       | PD26 | 111        | 112 | PD25    | AD5        | —          | —         |
| —         | —          | AD4       | PD24 | 113        | 114 | PD23    | AD3        | —          | —         |
| —         | —          | AD2       | PD22 | 115        | 116 |         | GND        | —          | —         |
| —         | —          | AD0       | PD20 | 117        | 118 | PD21    | AD1        | —          | —         |
| —         | —          | TXD0      | PD18 | 119        | 120 | PD19    | ADTRG      | —          | —         |
| PWMFI3    | SPI0_NPCS3 | RTS0      | PD16 | 121        | 122 | PD17    | RXD0       | PIO        | —         |
| CANRX0    | SPI0_NPCS1 | SCK0      | PD14 | 123        | 124 | PD15    | CTS0       | SPI0_NPCS2 | CANTX0    |
| —         | —          | GND       | —    | 125        | 126 | PD13    | SPI0_NPCS0 | —          | —         |
| —         | —          | SPI0_SPCK | PD12 | 127        | 128 | PD11    | SPI0_MOSI  | —          | —         |
| —         | —          | SPI0_MISO | PD10 | 129        | 130 | PD9     | MCIO_CK    | —          | —         |
| PIO       | PWML3      | MCIO_DA7  | PD8  | 131        | 132 | PD7     | MCIO_DA6   | TCLK0      | PWMH3     |
| PWML2     | TIOB0      | MCIO_DA5  | PD6  | 133        | 134 |         | GND        | —          | —         |
| PWMH2     | TIOA0      | MCIO_DA4  | PD5  | 135        | 136 | PD4     | MCIO_DA3   | —          | —         |
| —         | —          | MCIO_DA2  | PD3  | 137        | 138 | PD2     | MCIO_DA1   | —          | —         |
| —         | —          | MCIO_DA0  | PD1  | 139        | 140 | PD0     | MCIO_CDA   | —          | —         |
| VDDIOP1   |            |           |      | 141        | 142 | VDDIOP1 |            |            |           |

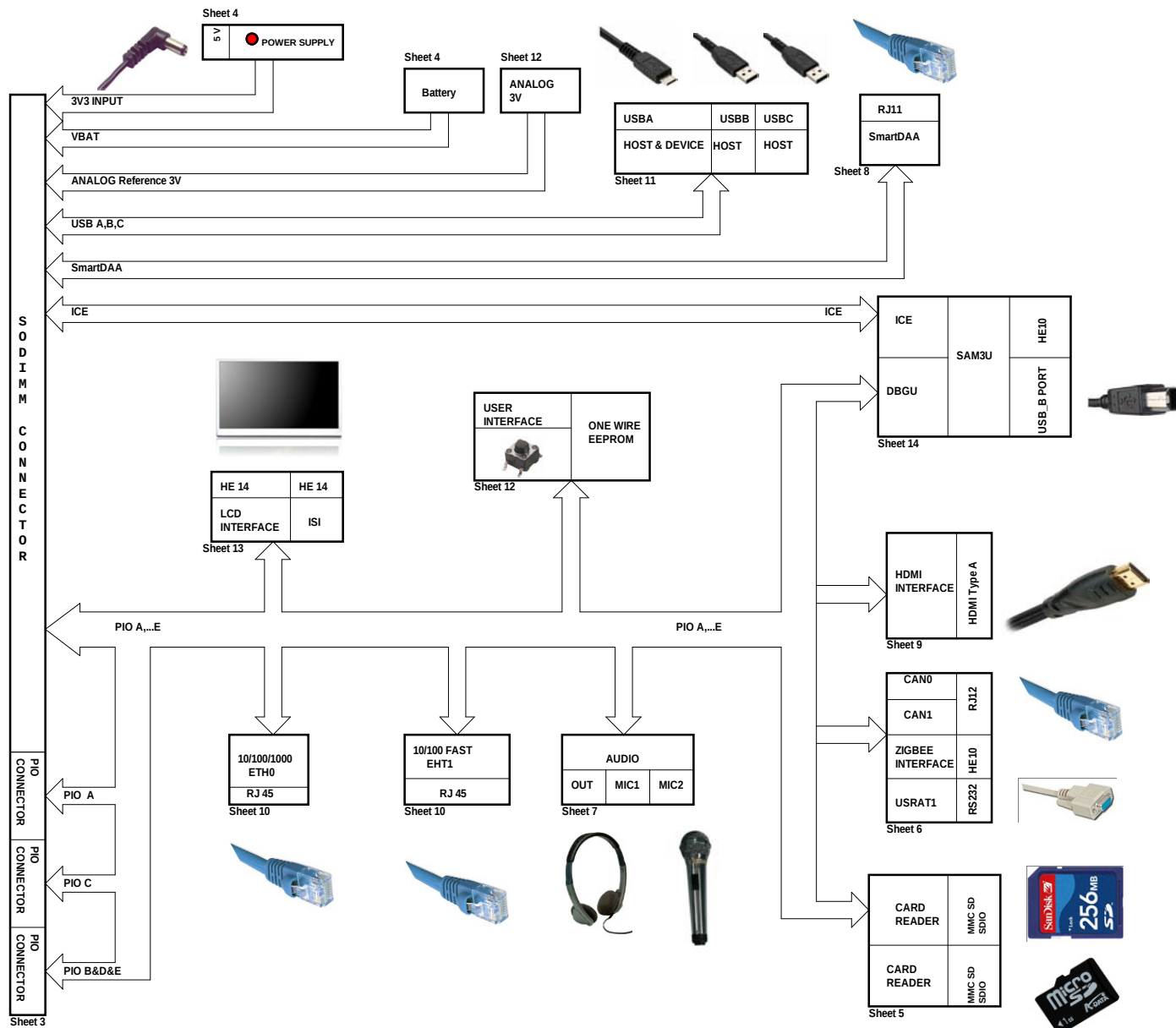
Table 5-27. SODIMM200 CON1 Signal Descriptions

| PIOC | PIOB     | PIOA      |      | SODIMM 200 |     |      | PIOA     | PIOB    | PIOC |
|------|----------|-----------|------|------------|-----|------|----------|---------|------|
| —    | —        | GND       | —    | 143        | 144 | PB13 | GRXER    | PWML3   | —    |
| —    | RF1      | GTXER     | PB10 | 145        | 146 | PB12 | GRXDV    | PWMH3   | —    |
| —    | CANRX1   | GCRS      | PB14 | 147        | 148 | PB15 | GCOL     | CANTX1  | —    |
| —    | GTX4     | MCI1_CDA  | PB19 | 149        | 150 | PB20 | MCI1_DA0 | GTX5    | —    |
| —    | GTX6     | MCI1_DA1  | PB21 | 151        | 152 | PB22 | MCI1_DA2 | GTX7    | —    |
| —    | GRX4     | MCI1_DA3  | PB23 | 153        | 154 | —    | GND      | —       | —    |
| —    | GRX5     | MCI1_CK   | PB24 | 155        | 156 | PB25 | SCK1     | GRX6    | —    |
| —    | —        | GND       | —    | 157        | 158 | PB27 | RTS1     | PWMH1   | —    |
| —    | USB A    | USBA_DP   | —    | 159        | 160 | PB29 | TXD1     | PIO     | —    |
| —    | USB A    | USBA_DM   | —    | 161        | 162 | PB31 | DTXD     | —       | —    |
| —    | —        | GND       | —    | 163        | 164 | PB30 | DRXD     | —       | —    |
| —    | USB B    | USBB_DP   | —    | 165        | 166 | PB26 | CTS1     | GRX7    | —    |
| —    | USB B    | USBB_DM   | —    | 167        | 168 | PB28 | RXD1     | PIO     | —    |
| —    | —        | GND       | —    | 169        | 170 | —    | GND      | —       | —    |
| —    | USB C    | USBC_DP   | —    | 171        | 172 | DIB  | DIBP     | —       | —    |
| —    | USB C    | USBC_DM   | —    | 173        | 174 | DIB  | DIBN     | —       | —    |
| —    | —        | GND_ETH   | —    | 175        | 176 | —    | GND      | —       | —    |
| —    | GIGA_ETH | ETH0_TX1+ | —    | 177        | 178 | —    | JTAGSEL  | SYSC    | —    |
| —    | GIGA_ETH | ETH0_TX1- | —    | 179        | 180 | —    | WKUP     | SYSC    | —    |
| —    | GIGA_ETH | ETH0_RX1+ | —    | 181        | 182 | —    | SHDN     | SYSC    | —    |
| —    | GIGA_ETH | ETH0_RX1- | —    | 183        | 184 | —    | BMS      | RSTJTAG | —    |
| —    | —        | GND_ETH   | —    | 185        | 186 | —    | nRST     | SYSC    | —    |
| —    | GIGA_ETH | ETH0_TX2+ | —    | 187        | 188 | —    | nTRST    | RSTJTAG | —    |
| —    | GIGA_ETH | ETH0_TX2- | —    | 189        | 190 | —    | TDI      | RSTJTAG | —    |
| —    | GIGA_ETH | ETH0_RX2+ | —    | 191        | 192 | —    | TCK      | RSTJTAG | —    |
| —    | GIGA_ETH | ETH0_RX2- | —    | 193        | 194 | —    | TMS      | RSTJTAG | —    |
| —    | —        | GND       | —    | 195        | 196 | —    | TDO      | RSTJTAG | —    |
| —    | —        | LED2      | —    | 197        | 198 | —    | RTCK     | RSTJTAG | —    |
| —    | —        | LED1      | —    | 199        | 200 | —    | GND      | —       | —    |

## 5.5 Main Board Schematics

This section contains the following schematics:

- Block diagram
- General information
- SODIMM
- Power supply
- HSMCI
- CAN & ZigBee & USART1
- Audio
- Smart DAA
- HDMI
- ETH
- USB interface
- Miscellaneous
- LCD and ISI
- On-board JTAG interface



REVISION HISTORY

| REV | DATA    | NOTE              |
|-----|---------|-------------------|
| A   | 2011.11 | ORIGINAL RELEASED |
| B   | 2012.03 | SECOND RELEASED   |
| C   | 2012.10 | THIRD RELEASED    |

JUMPER and SOLDERDROP

| PAGE | REFERENCE | DEFAULT | FUNCTION                                                   |
|------|-----------|---------|------------------------------------------------------------|
| 3    | JP1       | 1-2     | VDDIOP0 or 5V selection for J1                             |
|      | JP2       | 1-2     | VDDIOP0 or 5V selection for J2                             |
|      | JP3       | 1-2     | VDDIOP1 or 5V selection for J3                             |
|      | JP9       | OPEN    | Default boot on embedded ROM,Close boot on external memory |
| 4    | JP4       | CLOSE   | Backup supply on/off                                       |
|      | JP5       | CLOSE   | Force power on function                                    |
| 5    | JP6       | CLOSE   | MCIO write protect select                                  |
| 6    | JP7       | CLOSE   | CAN0 diff termination select                               |
|      | JP8       | CLOSE   | CAN1 diff termination select                               |
|      | JP10      | OPEN    | Zigbee Power on/off select                                 |
| 12   | JP14      | 1-2     | ADVREF input selection                                     |
| 14   | JP15      | OPEN    | JTAG Enabled,close to disable                              |
| 14   | JP16      | OPEN    | CDC Enabled,close to disable                               |
| 11   | JP17      | OPEN    | Enable LCD for D31,D33,D34                                 |
|      |           | CLOSE   | Disable LCD for D35                                        |

TABLE OF CONTENTS

| PAGE | DESCRIPTION          |
|------|----------------------|
| 1    | Block Diagram        |
| 2    | Describe             |
| 3    | SODIMM               |
| 4    | POWER SUPPLY         |
| 5    | HSMCI                |
| 6    | CAN & ZIGBEE &USART1 |
| 7    | AUDIO                |
| 8    | SmartDAA             |
| 9    | HDMI                 |
| 10   | ETH                  |
| 11   | USB Interface        |
| 12   | Miscellaneous        |
| 13   | LCD&ISI              |
| 14   | Segger-SAM3U         |

PIO MUXING

| PIOA | USAGE  | PIOA | USAGE     | PIOB      | USAGE    | PIOB   | USAGE    | PIOC | USAGE    | PIOC | USAGE      | PIOD    | USAGE    | PIOD   | USAGE     | PIOE            | USAGE | PIOE | USAGE    |          |
|------|--------|------|-----------|-----------|----------|--------|----------|------|----------|------|------------|---------|----------|--------|-----------|-----------------|-------|------|----------|----------|
| PA0  | LCDD0  | PA16 | ISI_D0    | PB0       |          | PB16   |          | PC0  | E1_TX0   | PC16 | TK0        | PD0     | MCIO_CDA | PD16   | INT_AUDIO | PE0             |       | PE16 |          |          |
| PA1  | LCDD1  | PA17 | ISI_D1    | PB1       |          | PB17   |          | PC1  | E1_TX1   | PC17 | TF0        | PD1     | MCIO_DA0 | PD17   | MCIO_CD   | PE1             |       | PE17 |          |          |
| PA2  | LCDD2  | PA18 | ISI_D2    | PB2       |          | PB18   |          | PC2  | E1_RX0   | PC18 | TD0        | PD2     | MCIO_DA1 | PD18   | MC11_CD   | PE2             |       | PE18 |          |          |
| PA3  | LCDD3  | PA19 | ISI_D3    | PB3       |          | PB19   | MC11_CDA | PC3  | E1_RX1   | PC19 | RK0        | PD3     | MCIO_DA2 | PD19   | ADTRG     | PE3             |       | PE19 |          |          |
| PA4  | LCDD4  | PA20 | ISI_D4    | PB4       |          | PB20   | MC11_DA0 | PC4  | E1_TXEN  | PC20 | RF0        | PD4     | MCIO_DA3 | PD20   | AD0_XP    | PE4             |       | PE20 |          |          |
| PA5  | LCDD5  | PA21 | ISI_D5    | PB5       |          | PB21   | MC11_DA1 | PC5  | E1_CRSDV | PC21 | RD0        | PD5     | MCIO_DA4 | PD21   | AD1_XM    | PE5             |       | PE21 |          |          |
| PA6  | LCDD6  | PA22 | ISI_D6    | PB6       |          | PB22   | MC11_DA2 | PC6  | E1_RXER  | PC22 | SPI1_MISO  | PD6     | MCIO_DA5 | PD22   | AD2_YP    | PE6             |       | PE22 |          |          |
| PA7  | LCDD7  | PA23 | ISI_D7    | PB7       |          | PB23   | MC11_DA3 | PC7  | E1_TXCK  | PC23 | SPI1_MOSI  | PD7     | MCIO_DA6 | PD23   | AD3_YM    | PE7             |       | PE23 |          |          |
| PA8  | LCDD8  | PA24 | LCDPWM    | PB8       |          | PB24   | MC11_CK  | PC8  | E1_MDC   | PC24 | SPI1_SPCK  | PD8     | MCIO_DA7 | PD24   | AD4_LR    | PE8             |       | PE24 | ISI_RST  |          |
| PA9  | LCDD9  | PA25 | LCDDISP   | PB9       |          | PB25   |          | PC9  | E1_MDI0  | PC25 | SPI1_NPCS0 | PD9     | MCIO_CK  | PD25   | EN5V_HDA  | PE9             |       | PE25 | ONE_WIRE |          |
| PA10 | LCDD10 | PA26 | LCDSVSYNC | PB10      | PWR_MCIO | PB26   | CTS1     | PC10 | LCDD20   | PC26 | TWD1       | ISI_D11 | PD10     |        | PD26      | EN5V_HDB        | PE10  |      | PE26     |          |
| PA11 | LCDD11 | PA27 | LCDSHSYNC | PB11      |          | PB27   | RTS1     | PC11 | LCDD19   | PC27 | TWCK1      | ISI_D10 | PD11     |        | PD27      | EN5V_HDC        | PE11  | PE27 | PB_USER1 | LCDD22   |
| PA12 | LCDD12 | PA28 | LCDPCK    | PB12      | PWR_MC11 | PB28   | RXD1     | PC12 | LCDD18   | PC28 | SPI1_NPCS3 | ISI_D9  | PD12     |        | PD28      | OVCUR_USB       | PE12  | PE28 | ZB_SLPTR | LCDD23   |
| PA13 | LCDD13 | PA29 | LCDDEN    | PB13      |          | PB29   | TXD1     | PC13 | LCDD17   | PC29 | HDMI_INT   | ISI_D8  | PD13     |        | PD29      | VBUS_SENSE      | PE13  | PE29 | ZB_RST   |          |
| PA14 | LCDD14 | PA30 | TWD0      | ISI_VSYNC | PB14     | CANRX1 |          | PC14 | LCDD16   | PC30 |            | ISI_PCK | PD14     | CANRX0 | PD30      | CK0(Audio,HDMI) | PE14  | PE30 | ZB_IRQ1  | INT_ETH1 |
| PA15 | LCDD15 | PA31 | TWCK0     | ISI_HSYNC | PB15     | CANTX1 |          | PC15 | LCDD21   | PC31 | RESET_HDMI |         | PD15     | CANTX0 | PD31      | PCK1(ISI_MCK)   | PE15  | PE31 | ZB_IRQ0  |          |

SAMA5D3x config

|        | SAMA5D31 | SAMA5D33 | SAMA5D34 | SAMA5D35 |
|--------|----------|----------|----------|----------|
| CAN0   |          |          | ✓        | ✓        |
| CAN1   |          |          | ✓        | ✓        |
| GMAC   |          | ✓        | ✓        | ✓        |
| EMAC   | ✓        |          |          | ✓        |
| HSMCI2 | ✓        |          | ✓        | ✓        |
| LCDC   | ✓        | ✓        | ✓        |          |
| USART0 | ✓        |          |          | ✓        |
| USART1 | ✓        |          |          | ✓        |
| ISI    | ✓        | ✓        | ✓        | ✓        |
| TC1    |          |          |          | ✓        |

SCHEMATICS CONVENTIONS

|                                                           |
|-----------------------------------------------------------|
| (1) Resistance Unit: "K" is "Kohm", "R" is "Ohm"          |
| (2) "DNP" means the component is not populated by default |

TEST POINT

| PAGE | REFERENCE | FUNCTION |
|------|-----------|----------|
| 4    | TP1, TP2  | GND      |
| 4    | TP3       | 5V       |
| 4    | TP4       | 3V3      |
| 4    | TP5       | VDDIOP0  |
| 4    | TP6       | VDDIOP1  |
| 4    | TP7       | VDDIOM   |
| 4    | TP8       | VDDANA   |

DEFAULT NO POPULATE PARTS

| PAGE | REFERENCE                                                                   | FUNCTION                                                                                                             |
|------|-----------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------|
| 3    | R6,R51,R50,R120                                                             | Optional PD10,PD11,PD12,PD13 from MB                                                                                 |
| 5    | R58<br>R121                                                                 | Optional for MCIO Power supply mode<br>Optional for MCI1 Power supply mode                                           |
| 6    | R52, R53,R55,R56,R57,R82,JP10<br>R132,R133                                  | Optional Zigbee<br>Debug or USART1 option                                                                            |
| 7    | C89,C90,R118,R119,J26<br>R80,R81<br>R230                                    | Optional Audio Line out,mic in<br>Optional MIC level setting<br>Optional audio TK                                    |
| 9    | L38,L39,L40,L41<br>R89<br>R266<br>R42                                       | Optional HDMI EMI filter<br>HDMI chip I2C addresss setting<br>Optional for I2S PCLK<br>Optional for LCD PCLK         |
| 10   | R162,R170,R171,R172,R176,R177,C122,C123,                                    | Optional for KSZ8041NL                                                                                               |
| 12   | R144                                                                        | Optional pull up for DS28EC20P                                                                                       |
| 13   | R127                                                                        | Optional for ADC trigger                                                                                             |
| 14   | R79, R106,R107,R109,R113,R110,R112,R111,J9<br>R54<br>R63<br>D11,D12<br>R186 | Optional JTAG<br>SAM3U JTAG selection<br>5V Option<br>USB ESD protect option<br>Main 3V3 Optional for VCC_3V3_DEBUTG |



SAMA5D3x-MB

Describe

SCALE

1/1

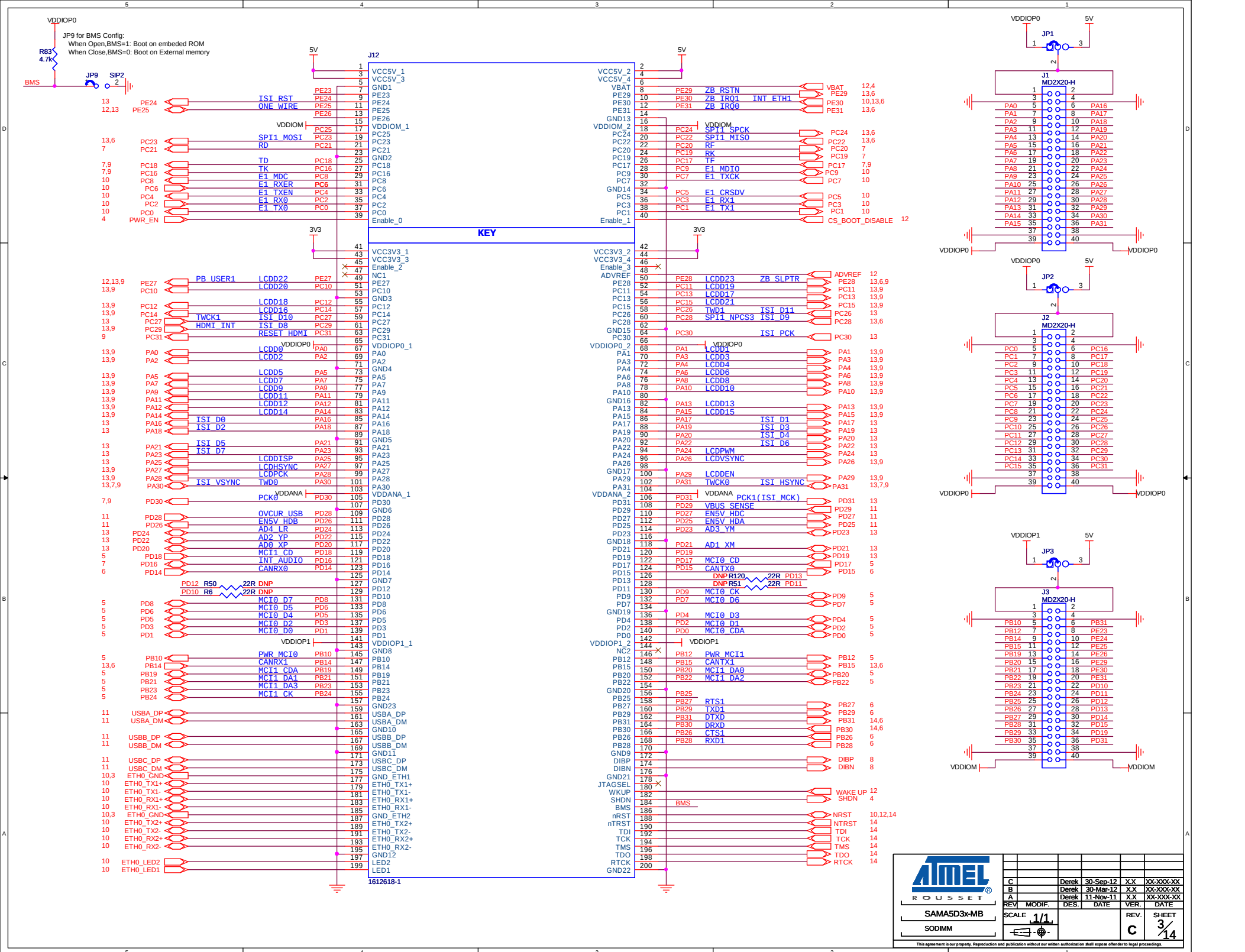
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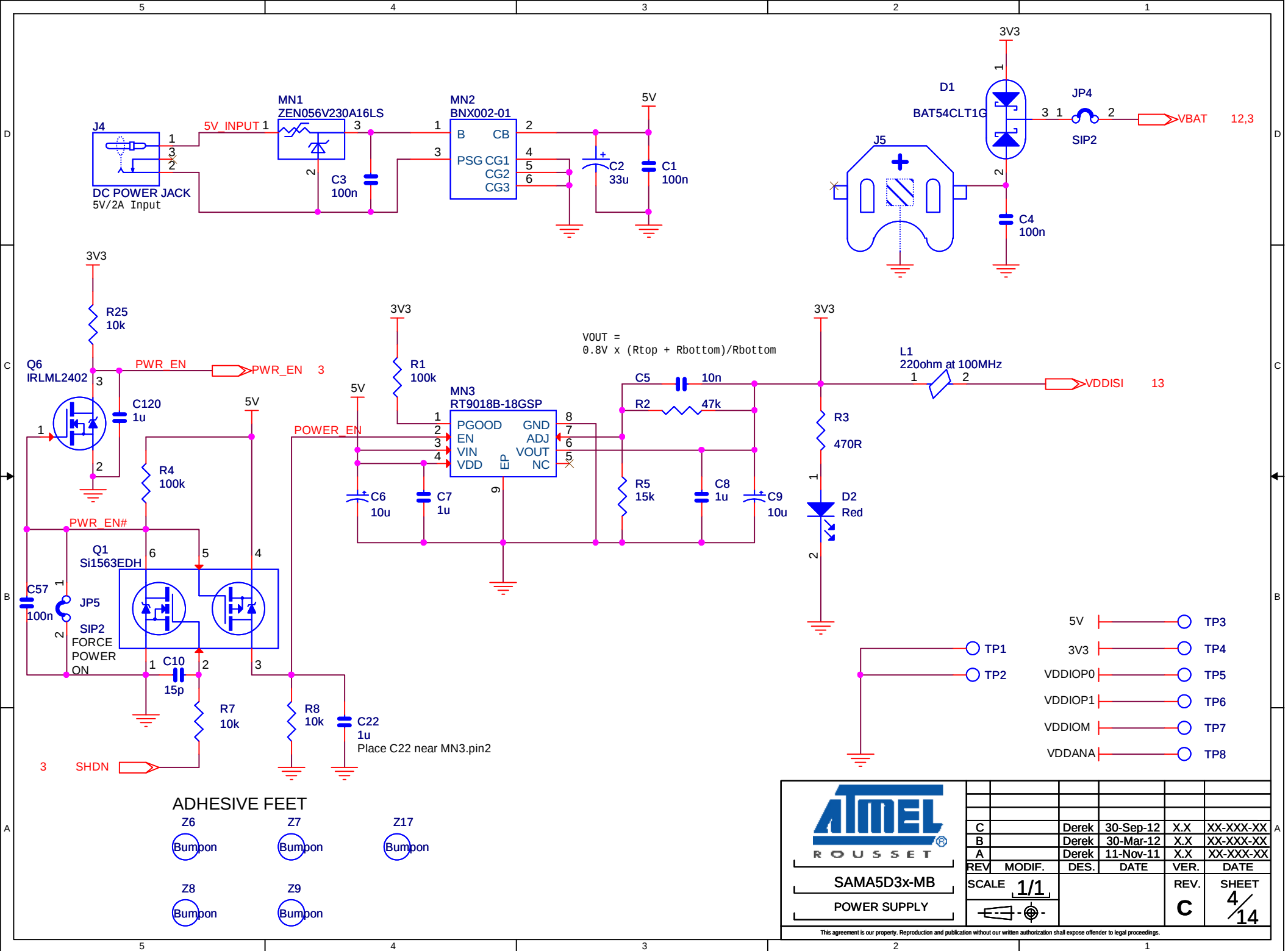
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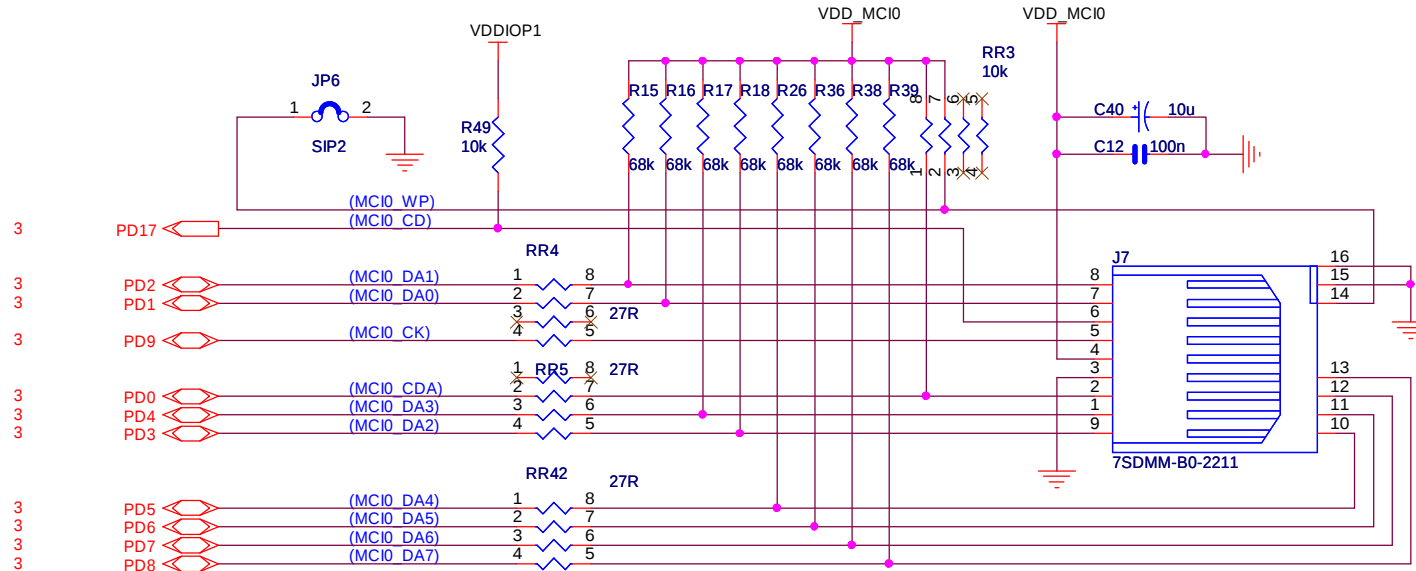
SHEET

2/14

|      |           |     |           |
|------|-----------|-----|-----------|
| DATE | 30-Sep-12 | XX  | XX-XXX-XX |
| DATE | 30-Mar-12 | XX  | XX-XXX-XX |
| DATE | 11-Nov-11 | XX  | XX-XXX-XX |
| REV  | DATE      | VER | DATE      |

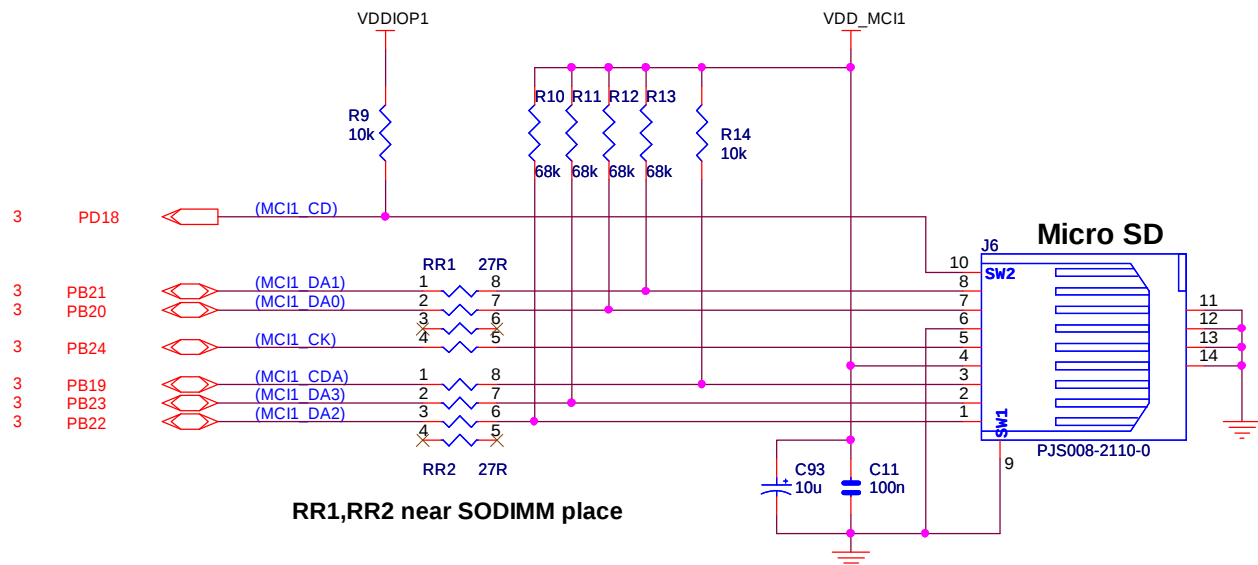
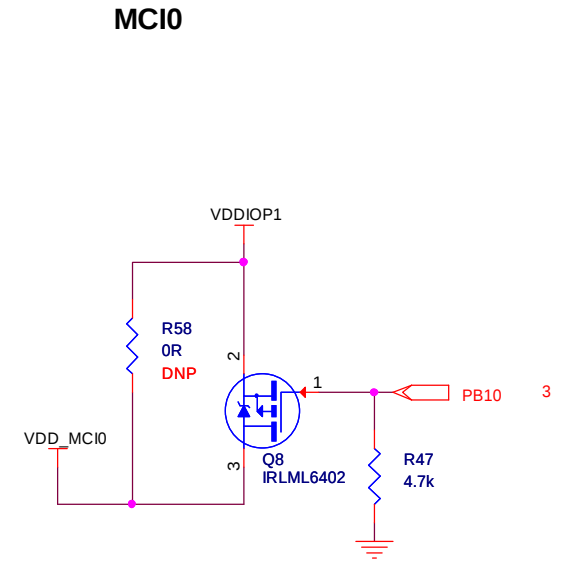




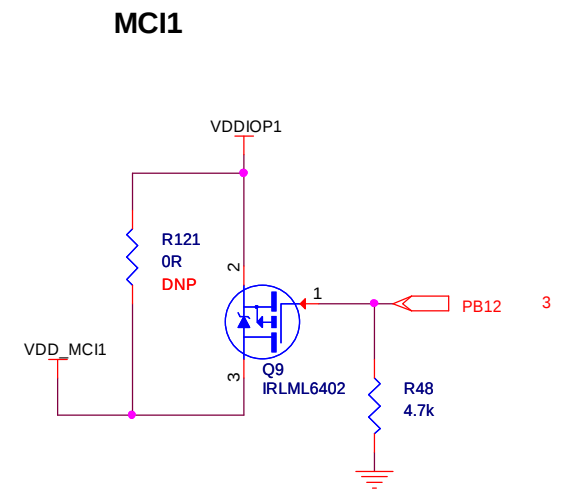


RR4,RR5,RR42 near SODIMM place

### SD/MMCPlus CARD INTERFACE - MCIO



RR1,RR2 near SODIMM place



|     |        |       |           |      |           |
|-----|--------|-------|-----------|------|-----------|
| C   |        | Derek | 30-Sep-12 | X.X  | XX-XXX-XX |
| B   |        | Derek | 30-Mar-12 | X.X  | XX-XXX-XX |
| A   |        | Derek | 11-Nov-11 | X.X  | XX-XXX-XX |
| REV | MODIF. | DES.  | DATE      | VER. | DATE      |

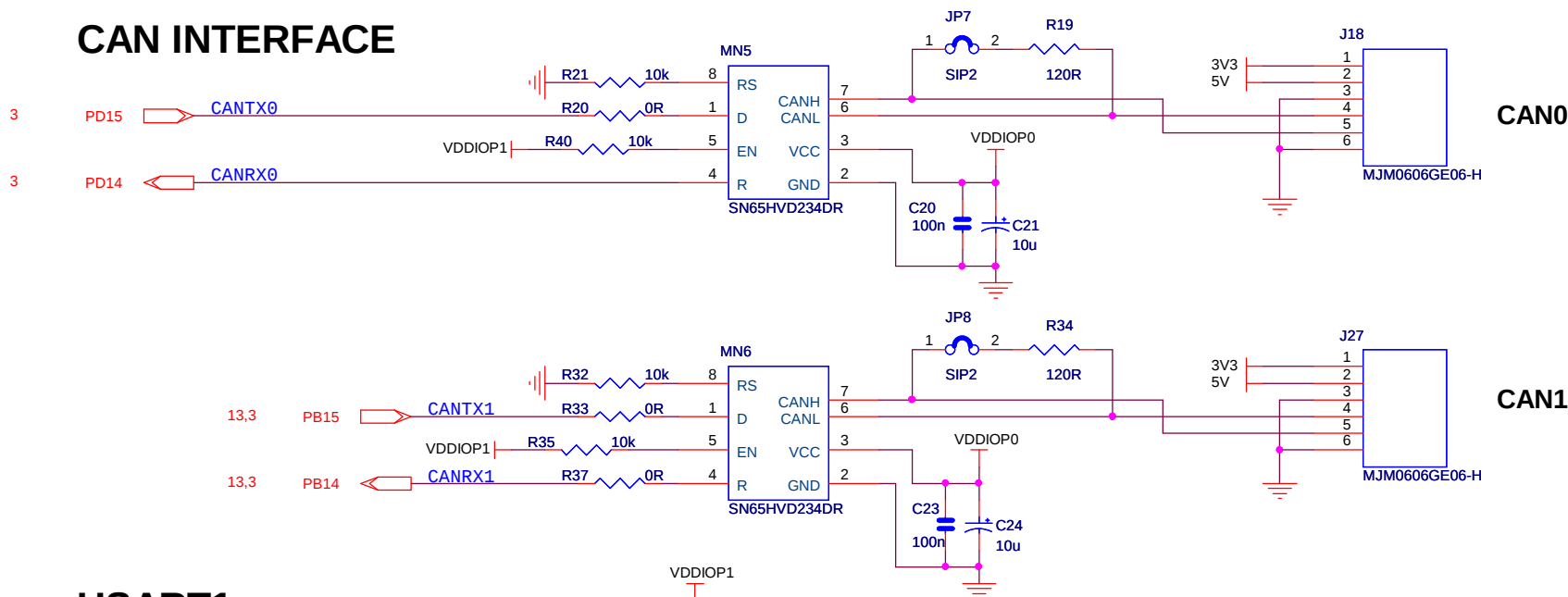
**SAMA5D3x-MB**  
HSMCI

SCALE **1/1**

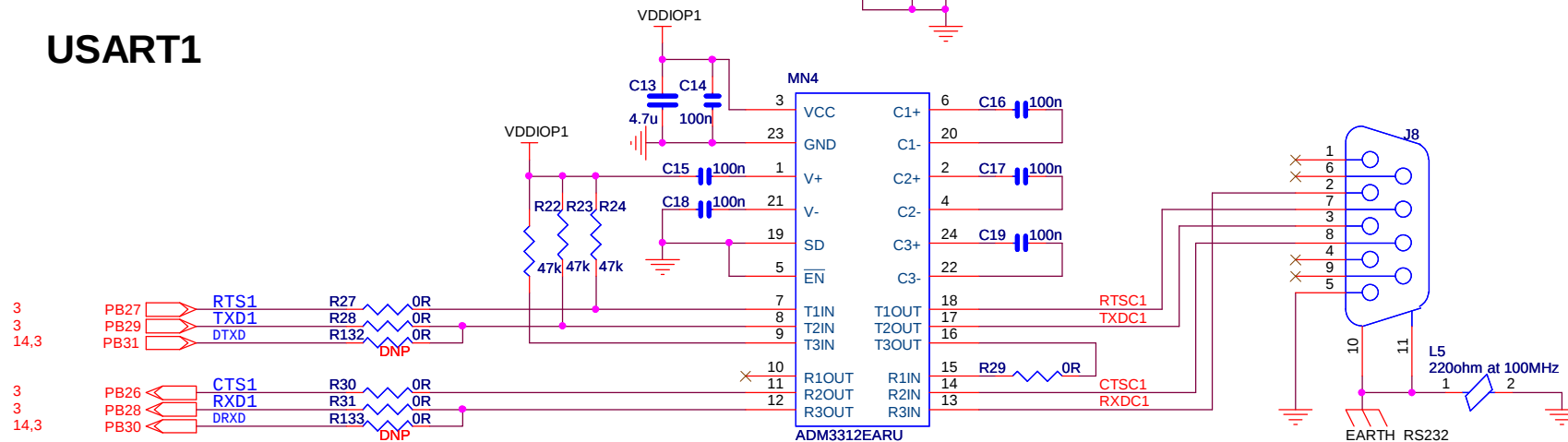
REV. **C**  
 SHEET **5/14**

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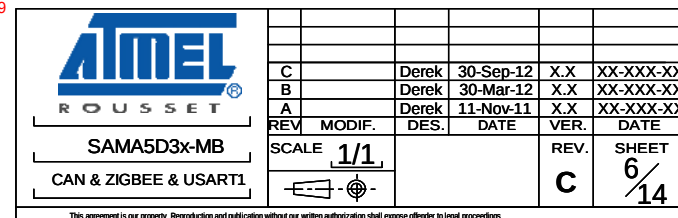
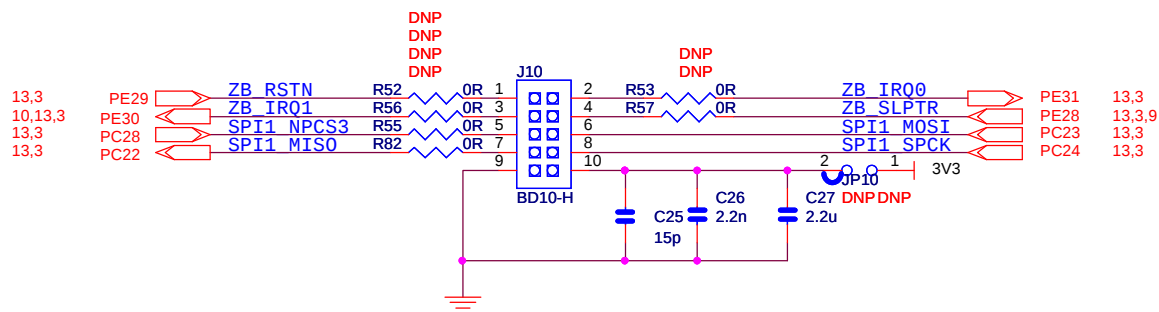
## CAN INTERFACE



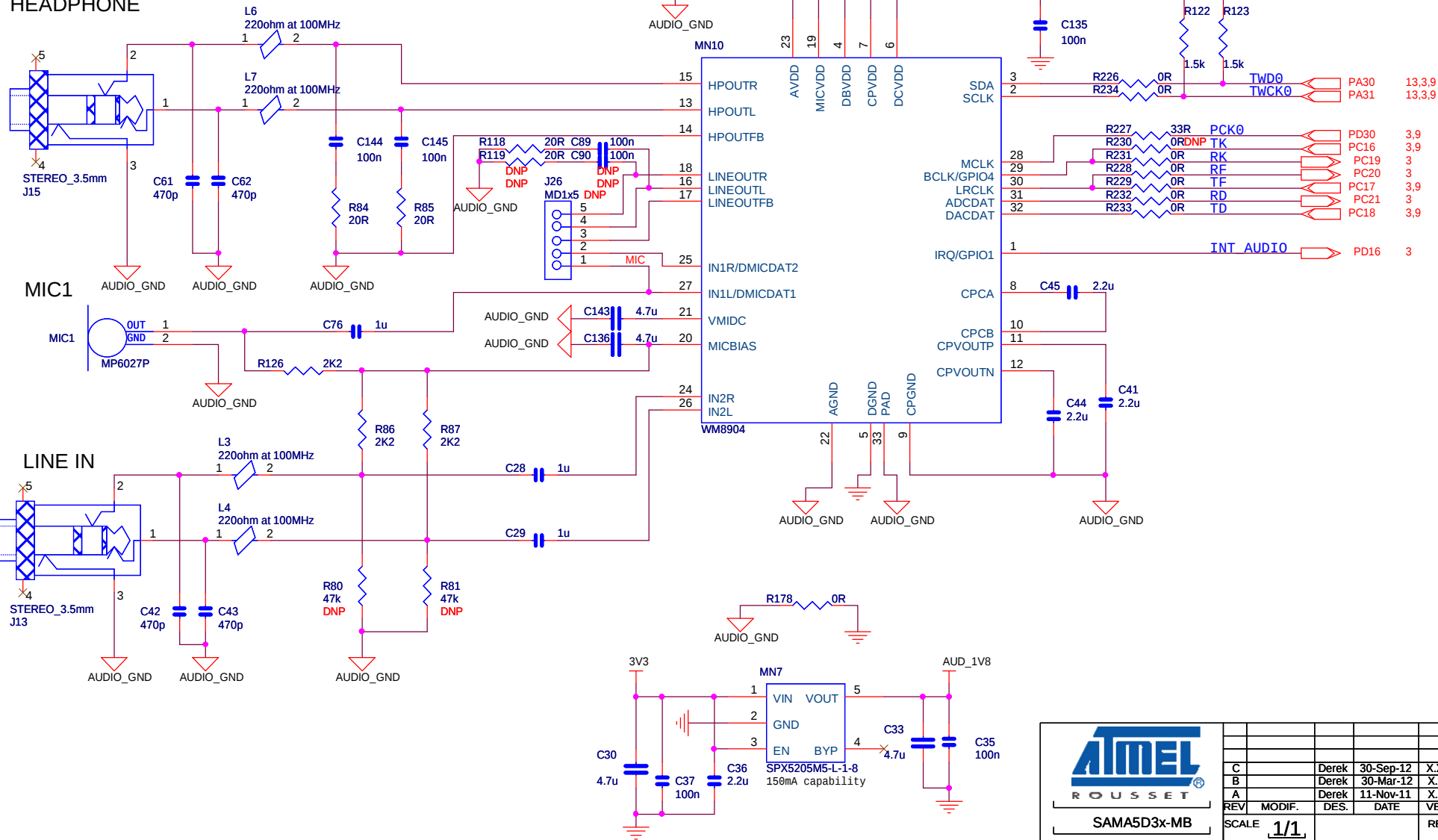
# USART1



## ZIGBEE INTERFACE



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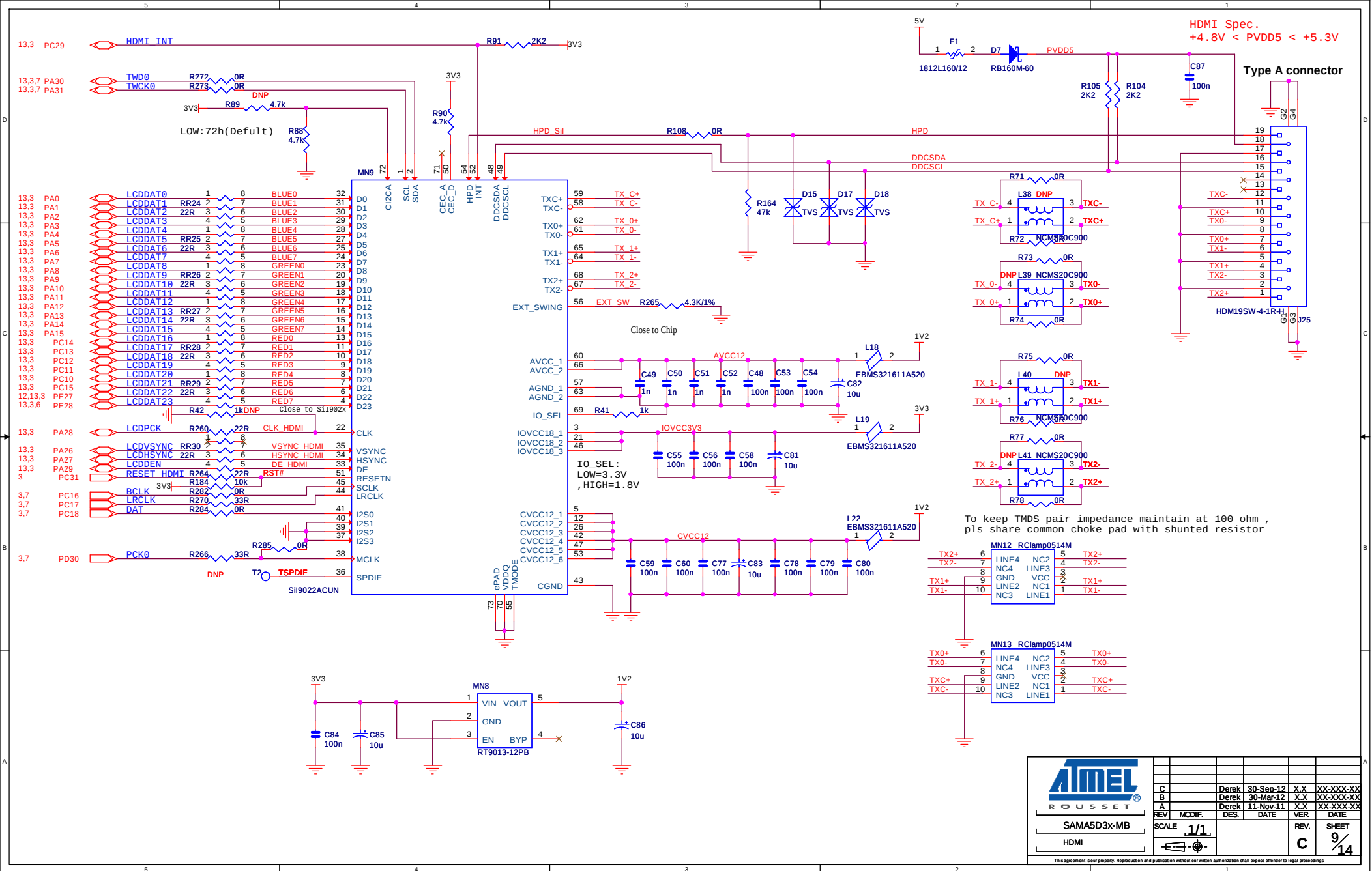


|                                                                                                                             |                                                                                       |            |           |          |             |       |
|-----------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|------------|-----------|----------|-------------|-------|
| <br><b>SAMA5D3x-MB</b><br><b>AUDIO</b> | C                                                                                     | Derek      | 30-Sep-12 | X.X      | XX-XXX-XX   |       |
|                                                                                                                             | B                                                                                     | Derek      | 30-Mar-12 | X.X      | XX-XXX-XX   |       |
|                                                                                                                             | A                                                                                     | Derek      | 11-Nov-11 | X.X      | XX-XXX-XX   |       |
|                                                                                                                             | REV                                                                                   | MODIF.     | DES.      | DATE     | VER.        | DATE  |
|                                                                                                                             | SCALE                                                                                 | <u>1/1</u> |           |          | REV.        | SHEET |
|                                                                                                                             |  |            |           | <b>C</b> | <b>7/14</b> |       |

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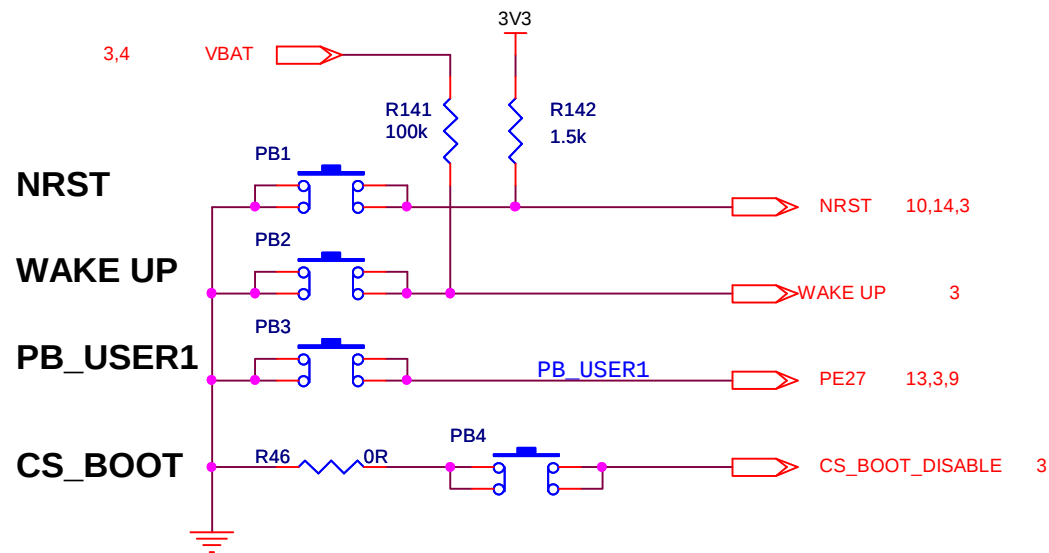




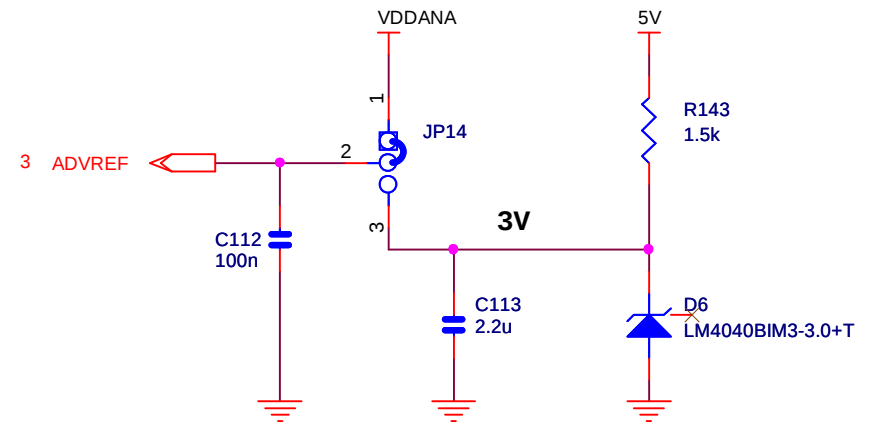




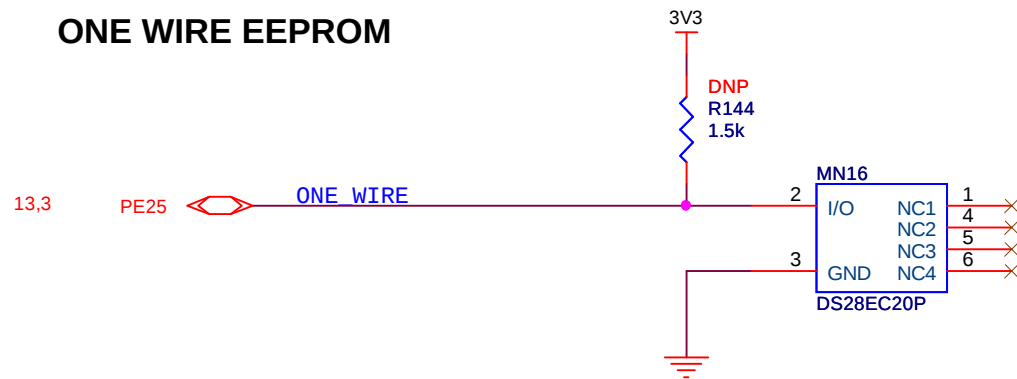
## PUSH BUTTON



## ANALOG Reference 3V

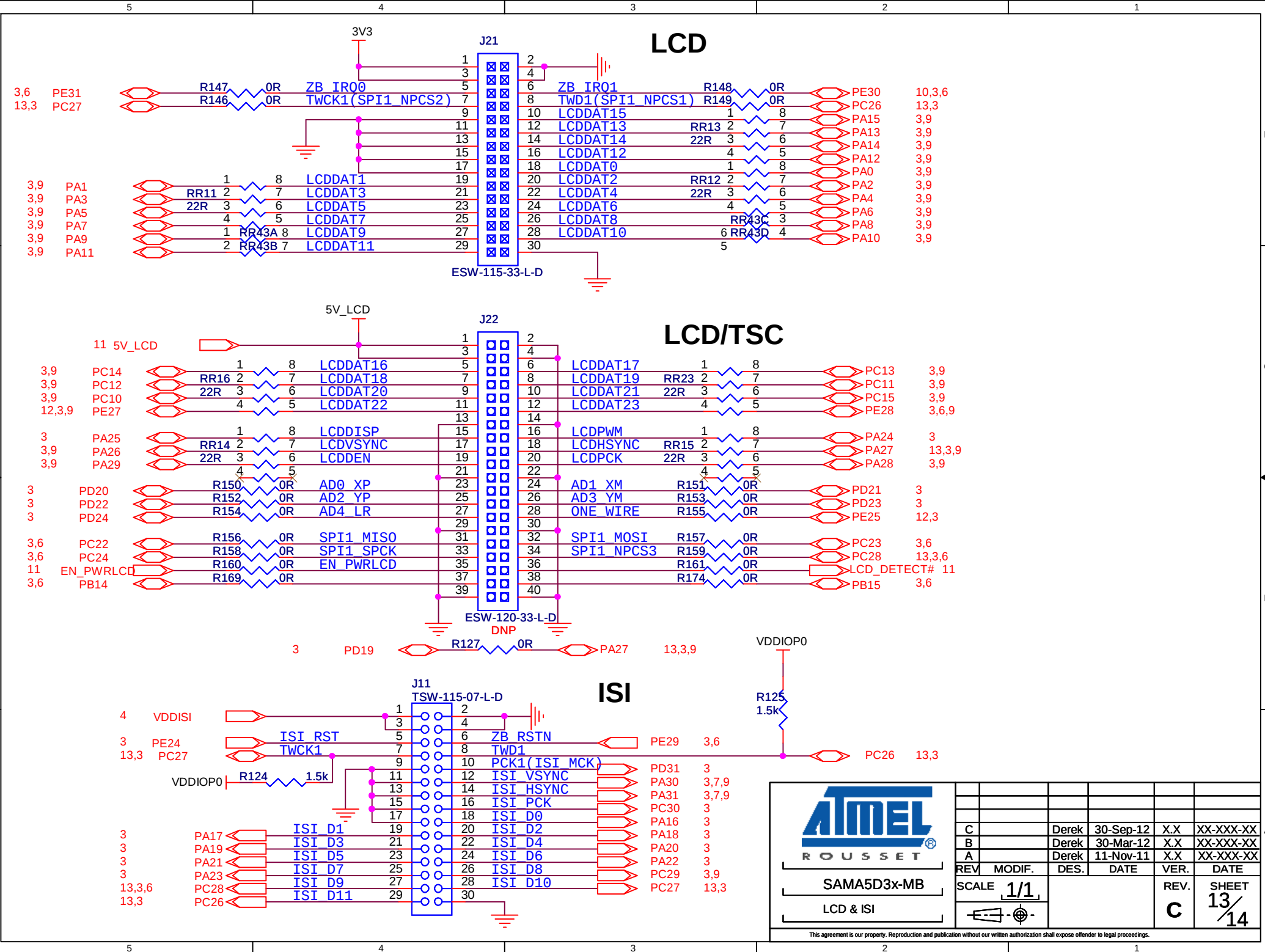


## ONE WIRE EEPROM



|           |        | C    | Derek | 30-Sep-12 | X.X XX-XXX-XX |
|-----------|--------|------|-------|-----------|---------------|
|           |        | B    | Derek | 30-Mar-12 | X.X XX-XXX-XX |
|           |        | A    | Derek | 11-Nov-11 | X.X XX-XXX-XX |
| REV       | MODIF. | DES. | DATE  | VER.      | DATE          |
| SCALE 1/1 |        |      |       | REV. C    | SHEET 12/14   |
|           |        |      |       |           |               |

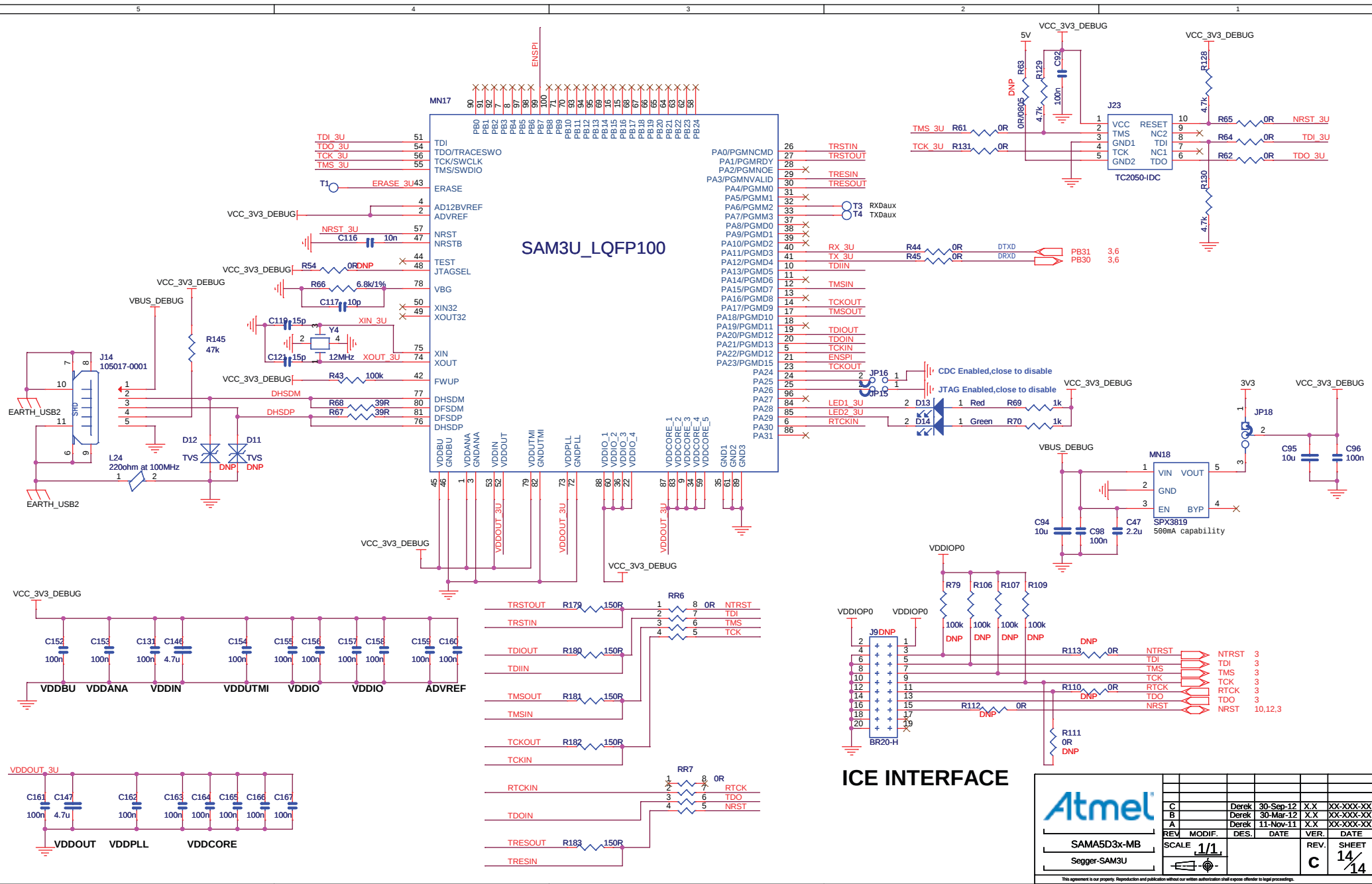
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SAMA5D3x-MB  
LCD & ISI

| REV   | MODIF. | DES.  | DATE      | VER. | DATE      |
|-------|--------|-------|-----------|------|-----------|
| C     |        | Derek | 30-Sep-12 | X.X  | XX-XXX-XX |
| B     |        | Derek | 30-Mar-12 | X.X  | XX-XXX-XX |
| A     |        | Derek | 11-Nov-11 | X.X  | XX-XXX-XX |
| SCALE | 1/1    |       |           | REV. | SHEET     |
|       |        |       |           | C    | 13/14     |

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**SAMA5D3x-MB**  
Segger-SAM3U

| REV | MODIF. | DES.  | DATE      | VER. | DATE     |
|-----|--------|-------|-----------|------|----------|
| C   |        | Derek | 30-Sep-12 | X.X  | XX-XX-XX |
| B   |        | Derek | 30-Mar-12 | X.X  | XX-XX-XX |
| A   |        | Derek | 11-Nov-11 | X.X  | XX-XX-XX |

SCALE **1/1**

REV. **C** SHEET **14/14**

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## 6. Optional Display Module (DM) Board

### 6.1 DM Board Overview

The DM board integrates a 5.0" TFT LCD module with touchscreen, as well as four QTouch pads.

Figure 6-1. DM Board



#### 6.1.1 Equipment List

The DM board components are:

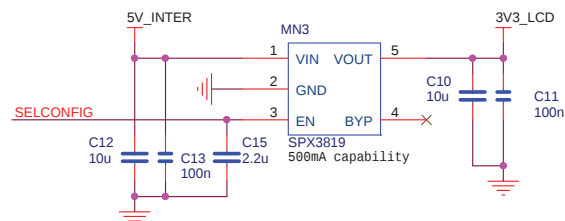
- One 5.0" TFT LCD module
- LCD back light driver
- 3.3V regulator
- QTouch device
- 1-wire device

#### 6.1.2 Function Blocks

##### 6.1.2.1 3.3V Regulator

The 5-0\_WVGA\_R\_AEA-DM Board features its own LDO for local power regulation. It accepts DC 5V power from 500 mA high-side power switch on EK and outputs a regulated +3.3V to most other circuits on the board.

Figure 6-2. DM Power Supply



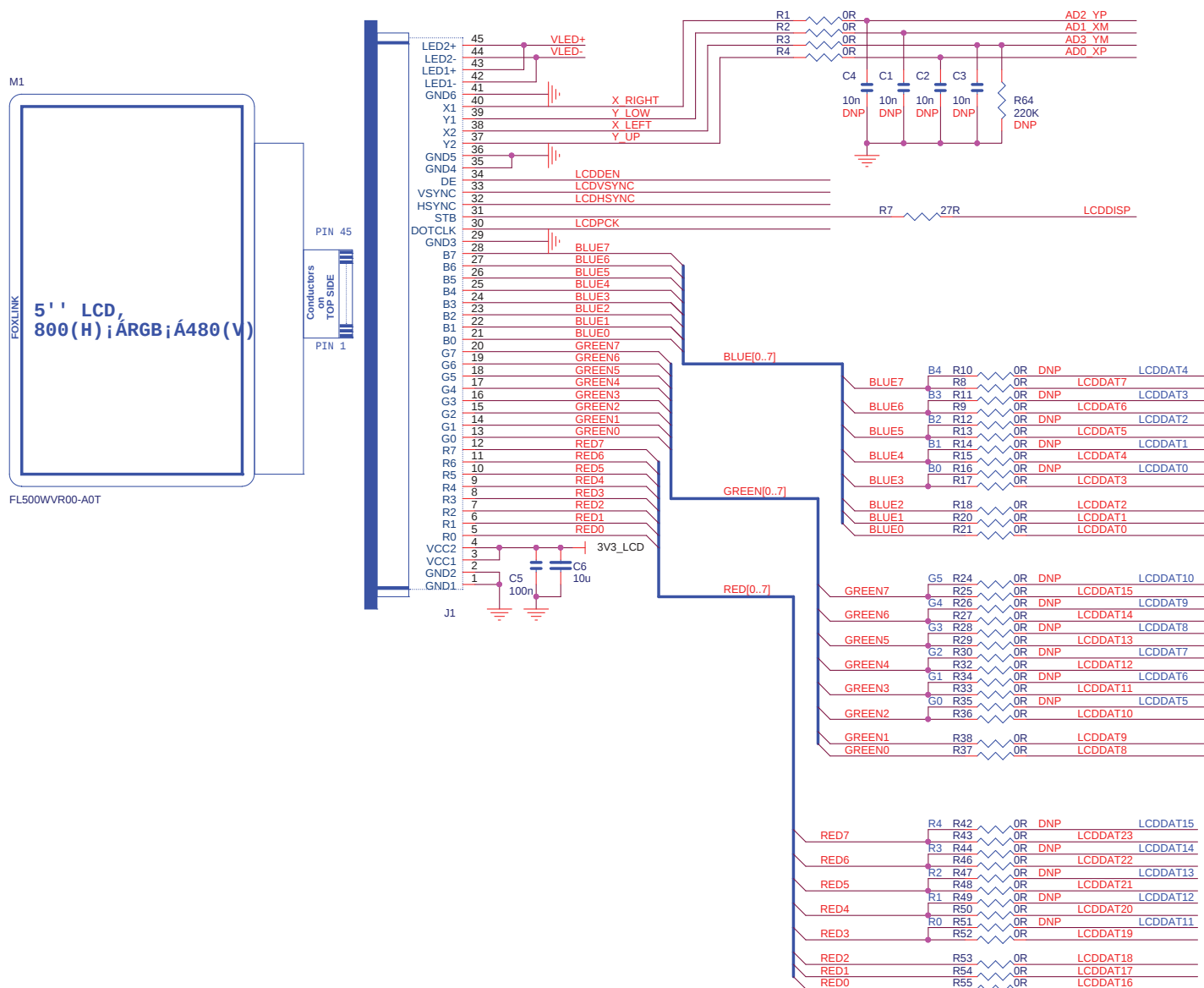
### 6.1.3 TFT LCD with Touch Panel

The 5-0\_WVGA\_R\_AEA-DM features an LCD controller. The 5" 800x480 LCD provides the DM with a low-power LCD display feature, backlight unit and a touch panel, similar to that used on commercial PDAs.

Graphics and text can be displayed on the dot matrix panel with up to 16 million colors by supplying 24-bit data signals (8bit x RGB by default) or 16-bit data signals (5+6+5bit x RGB in option). This allows the user to develop graphical user interfaces for a wide variety of applications.

**Warning:** Never connect/disconnect the LCD display from the board while the power supply is on. This can damage both boards.

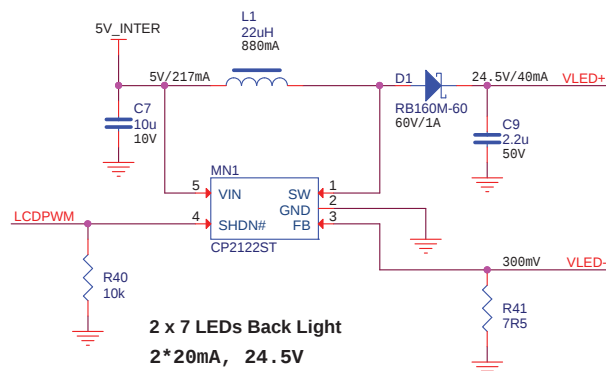
**Figure 6-3. LCD with Touch Panel**



## 6.1.4 Backlight

The backlight voltage is generated from a CP2122ST/CP2123ST boost converter. It is powered directly by the 5V DC from the EK board. The backlight level is controlled by a PWM signal generated from the SAMA5D3 series processor.

Figure 6-4. DM Back Light Control

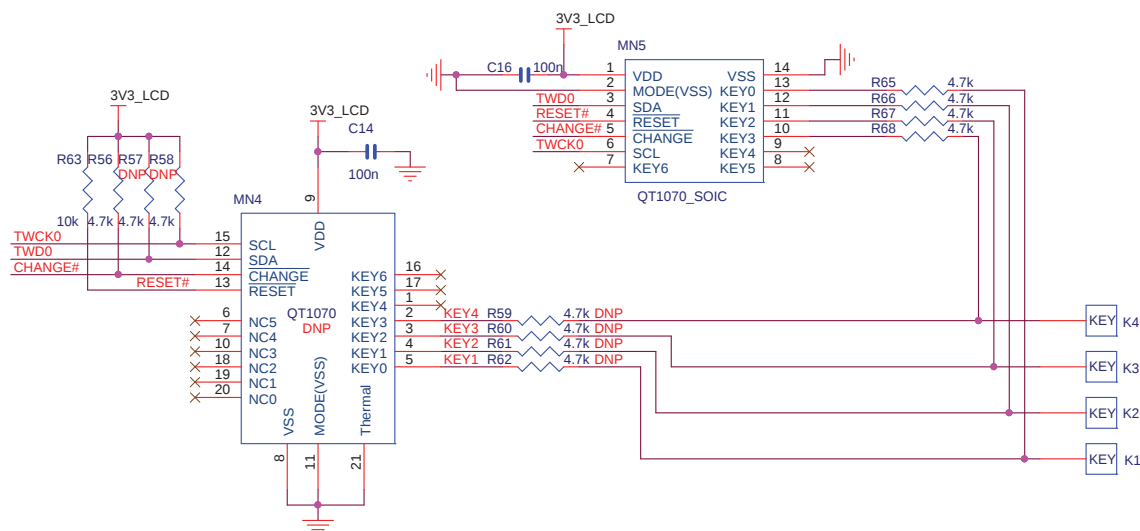


## 6.1.5 QTouch

The 5-0\_WVGA\_R\_AEA-DM board carries a QTouch device driven through a TWI interface. It manages four capacitive touch buttons directly printed on the PCB.

There is dual footprint for the QTouch device. SOIC is the default mounted one.

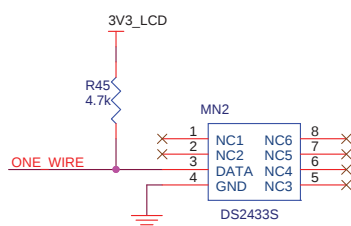
Figure 6-5. DM QTouch



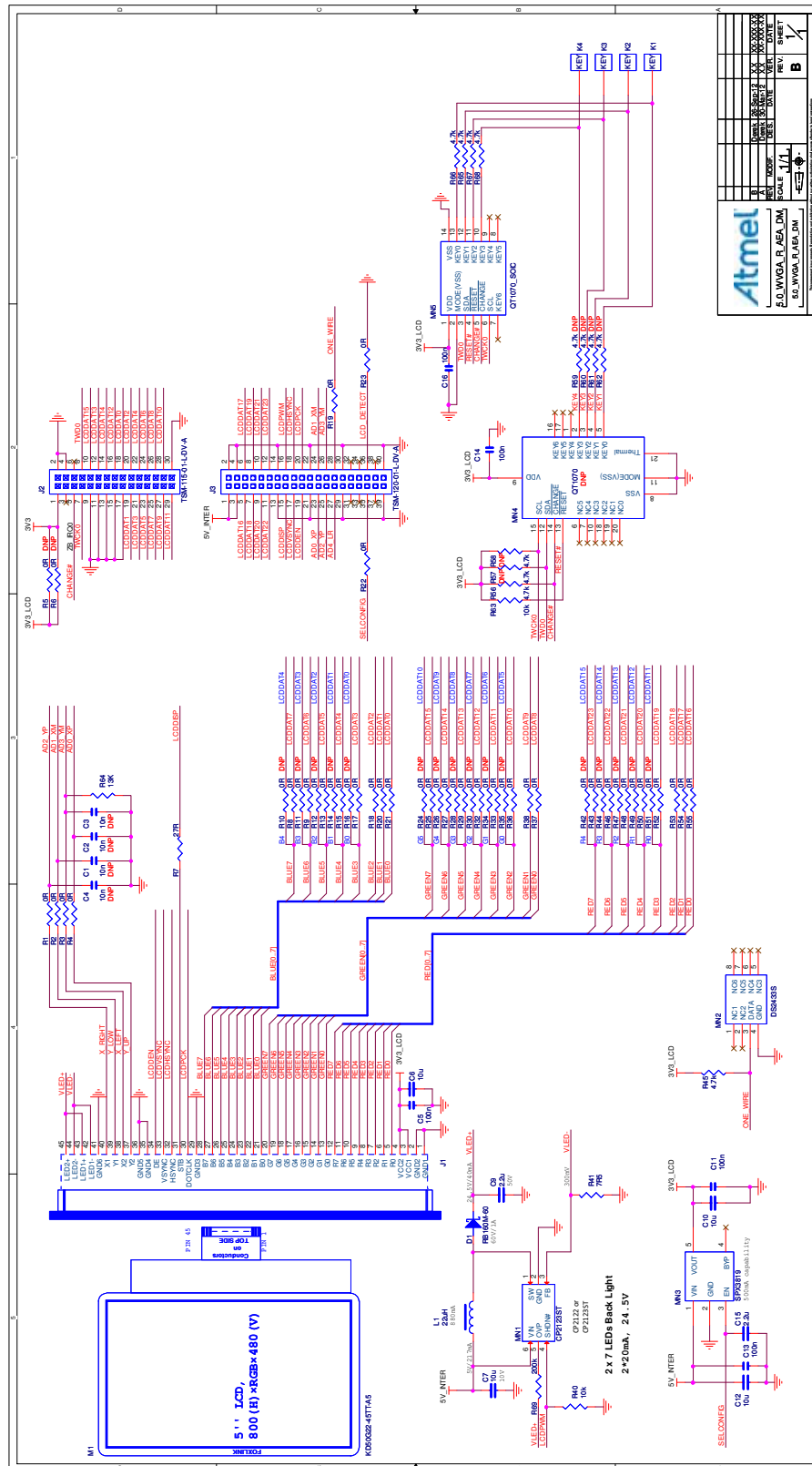
## 6.1.6 1-Wire

The 5-0\_WVGA\_R\_AEA-DM board also uses a 1-wire device as a “soft label” to store the information such as chip type, manufacture name, production date, etc.

Figure 6-6. DM 1-Wire



## 6.2 Schematics



## 7. Troubleshooting and Recommendations

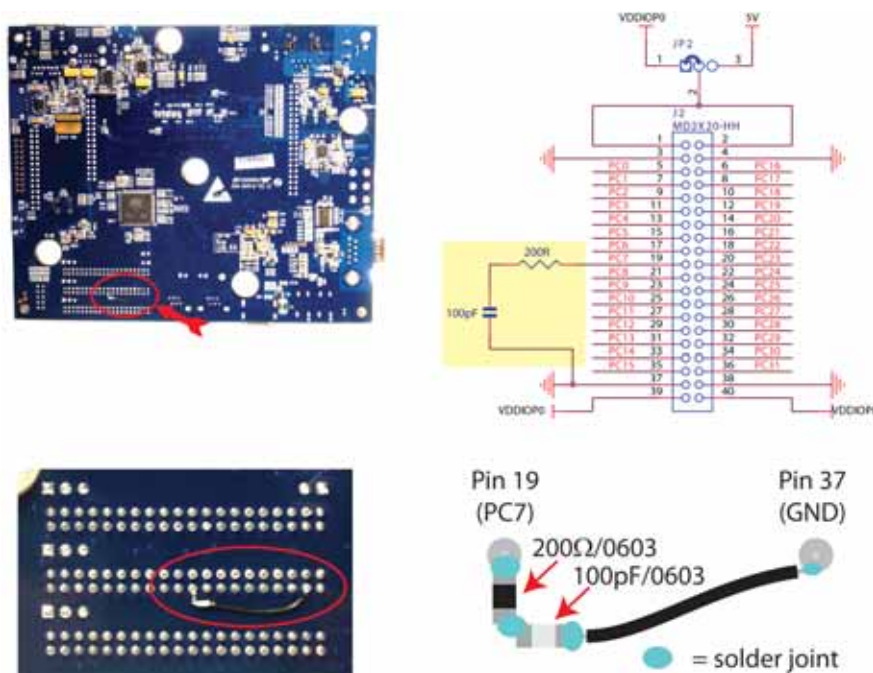
### 7.1 Errata

#### 7.1.1 Impedance Mismatch on Revision C of the SAMA5D3x Main Board

There is an impedance mismatch on the revision C of the SAMA5D3x main board, impacting the clock signal of the Ethernet PHY chip (MN20, KSZ8051RNL). This leads to a non-optimal data transmission on the ETH1 channel (J24), with timeouts and retries occurring from time to time.

**Resolution:** Add a line termination on signal PC7. Connect PC7 to ground through a 200 Ohm resistor in series with a 100pF ceramic capacitor. The connection point must be done at Pin 19 of Connector J2. [Figure 7-1](#) shows how and where to apply the fix.

Figure 7-1. Fixing An Impedance Mismatch on the Revision C of the SAMA5D3x Main Board



## 8. Revision History

Table 8-1. Revision History

| Document | Comments                                                                                                                                                                                                                                                                                                                                                  | Change Request Ref. |
|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|
| 11180B   | Changed document layout, including section numbering. Changed Embest to Embest/Flextronics throughout document.                                                                                                                                                                                                                                           | 9364                |
|          | In <a href="#">"Introduction"</a> and <a href="#">"Contents"</a> : Added SAMA5D36, SAMA5D36-EK and SAMA5D36-CM to lists of available references and to information for display modules (DM). Also throughout document.                                                                                                                                    | 9364                |
|          | In <a href="#">Table 1-1 "Evaluation Kit Specifications"</a> , removed information on temperature and relative humidity. Added information on CE and FCC compliancy. Added SAMA5D36-EK.                                                                                                                                                                   | 9363                |
|          | In <a href="#">Table 4-1 "CM Board Implementation"</a> , updated boards available from manufacturers.                                                                                                                                                                                                                                                     | 9360                |
|          | In <a href="#">Table 4-2 "CPU Module Specifications"</a> , removed 'optional' from details on NOR in Memory row.                                                                                                                                                                                                                                          | 9363                |
|          | In <a href="#">Section 4.2.3 "Configuration Items"</a> , removed "Dual ON/OFF switch for NAND Flash" and replaced with "One jumper for".                                                                                                                                                                                                                  |                     |
|          | In <a href="#">Table 4-3 "Boot Options"</a> , in row BMS OPEN: Added "...followed by:" after "ROM Boot" and added SAM-BA after TWI in column Type. In column Note, changed "Default boot on embedded ROM" to "Default boot is from embedded ROM". In row BMS CLOSE, changed "Boot on external NOR Flash memory" to "Boot from external NOR Flash memory". |                     |
|          | <a href="#">Section 4.2.4.1 "Boot Configuration"</a> : Revised throughout.                                                                                                                                                                                                                                                                                |                     |
|          | <a href="#">Section 4.3.3 "Reset Circuitry"</a> : Changed information on JTAG reset.                                                                                                                                                                                                                                                                      |                     |
|          | <a href="#">Section 4.3.6 "Serial Peripheral Interface Controller (SPI)"</a> : Revised throughout.                                                                                                                                                                                                                                                        |                     |
|          | <a href="#">Section 4.3.9 "Indicators"</a> : Removed specific information on red and blue LEDs. Added information on control by GPIO lines.                                                                                                                                                                                                               |                     |
|          | Added <a href="#">Section 4.4.2 "CPU Module Revision E Schematics"</a> .                                                                                                                                                                                                                                                                                  | 9364                |
|          | <a href="#">Table 5-1 "MB Technical Specifications"</a> , Mass Storage Interface: Updated information on all types of cards supported.                                                                                                                                                                                                                    | 9363                |
|          | - Added information on RoHS and CE and FCC compliancy.                                                                                                                                                                                                                                                                                                    |                     |
|          | - Removed temperature range information.                                                                                                                                                                                                                                                                                                                  |                     |
|          | <a href="#">Section 5.2.3 "Debug JTAG/ICE and DBGU"</a> : Modified details of ATSAM3U4C.                                                                                                                                                                                                                                                                  | 9360                |
|          | <a href="#">Section 5.2.3.1 "Disabling J-Link-OB-ATSAM3U4C"</a> : Revised throughout.                                                                                                                                                                                                                                                                     |                     |
|          | <a href="#">Section 5.2.3.2 "Hardware UART via CDC"</a> : Revised throughout.                                                                                                                                                                                                                                                                             |                     |
|          | <a href="#">Section 5.2.4 "USART"</a> : Revised throughout.                                                                                                                                                                                                                                                                                               |                     |
|          | <a href="#">Section 5.2.6 "Ethernet 10/100 (EMAC) Port"</a> : Revised throughout.                                                                                                                                                                                                                                                                         |                     |
|          | <a href="#">Section 5.2.10 "CAN Bus"</a> : Removed mention of two ports for connector J27.                                                                                                                                                                                                                                                                |                     |
|          | <a href="#">Section 5.2.14 "LED Indicators"</a> : Revised throughout.                                                                                                                                                                                                                                                                                     |                     |
|          | <a href="#">Section 5.2.15 "Pushbutton Switches"</a> : Changed fourth bullet.                                                                                                                                                                                                                                                                             |                     |
|          | Added <a href="#">Section 7.1 "Errata"</a> with <a href="#">Section 7.1.1 "Impedance Mismatch on Revision C of the SAMA5D3x Main Board"</a> .                                                                                                                                                                                                             | 8803                |
| 11180A   | First issue                                                                                                                                                                                                                                                                                                                                               |                     |



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