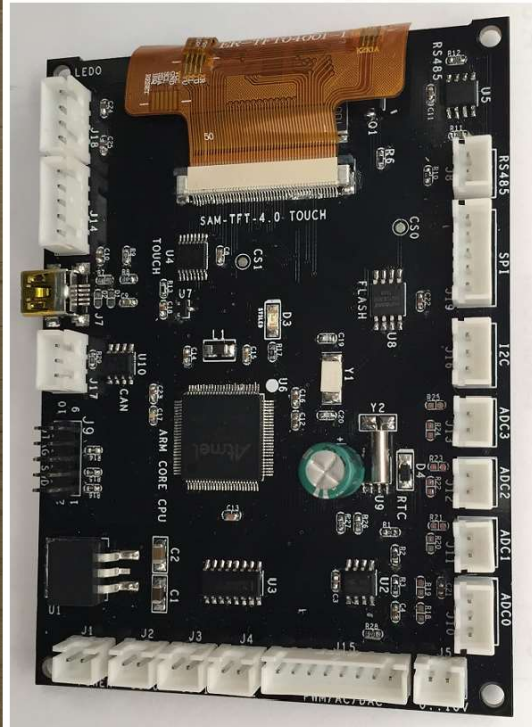
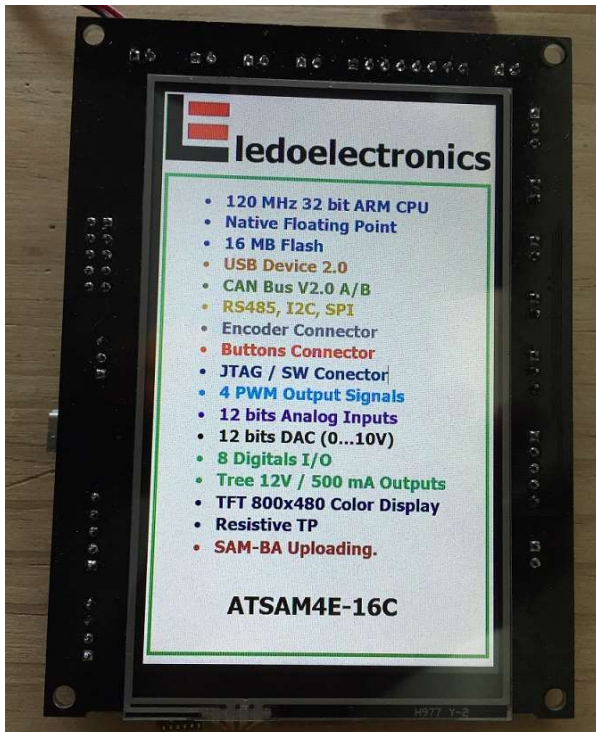


SAM TFT4.0 TOUCH BOARD



Hardware

- Control system based on the ATSAM4E-16C
32 bit Arm with floating point
- 4.0" 480x800 TFT color display with integrated NT35510 controller
Controlled by parallel interface of 16/18 bits
- Resistive touch screen with AD7843 controller
- External memory of 16 MBytes to store data or images
- Real-time clock with calendar and supercap backup
- 5 analog inputs of 12 bits, 0 ... 2.048V, 0 ... 10V, 4-20 mA
- An analog output 0 ... 10V of 12 bits
- Encoder and buttons connectors
- Three digital outputs 0 / 12V of 500 mA with ULN2003A
- Four PWM outputs
- USB Device 2.0 communication
- CAN BUS communication
- Communication Rs485

- **I2C communication**
- **SPI bus with CS signal available**
- **Does not need a programmer. USB programming with SAM-BA Bootloader**
- **SWD / JTAG connector for programming with Atmel-ICE**
- **12V supply voltage (from 9V to 15V DC)**
- **Maximum consumption current 150 mA**

Software

- **Several examples programs in C for the treatment of each of the hardware modules.**
- **All projects compiled with the free IDE Atmel Studio 7**
- **Graphic library for representation of characters and images on the Display with great simplicity.**
- **Geometric graphic library (Lines, Triangles, Rectangles, Pixels, etc.).**
- **Windows application, which allows to transfer Bitmaps from the PC to the flash memory of the board, through the USB bus. It also allows to take the micro to bootloader mode, for programming with Sam-ba.**

Applications

- **Industrial control systems of different degrees of complexity, guaranteed by the calculation power of the 32-bit micro with mathematical coprocessor, as well as by the versatility of the communications (USB, CANBUS, RS485, etc.)**
- **Control of different types of domestic and industrial equipment.**
- **Temperature control (incubators, refrigerators).**
- **Timers.**
- **Automatic pumping.**
- **Automatic Irrigation.**
- **Automation control.**
- **Sequencer.**
- **Ventilation system.**
- **Dosage.**
- **Generator of waves of different shapes, up to a frequency of 1 MHz.**
- **MODBUS master / slave.**
- **Display / Remote keyboard.**
- **Remote sensor.**
- **Stepper motor control (optional, requires expansion module).**
- **PWM control.**
- **PID control.**

- **Pulse counter**
- **Training kit for students**
- **Etc.**

The Board has been designed to guarantee high flexibility and comfort in its use. It has the necessary elements for the implementation of different control systems, which require the measurement of unipolar analog magnitudes. It has a 12-bit digital analog converter up to 2 Msps, with an external reference source of high stability $V_{ref} = 3.0V$. The ADC has five channels enabled, so that five unipolar signals can be measured. Four of the channels have voltage dividers, to adapt to the levels required by the application.

The presence of the real time clock with calendar, and the Flash memory of 16 MBytes allow the implementation of a Real Time Data Recorder. The USB bus allows data to be collected on a PC.

The analog output from 0 to 10V, as well as the three power outputs for the control of conventional relays or solid state, facilitate the implementation of a PID for the control of temperature, humidity, pressure, etc. or the speed regulation of a motor by means of a frequency inverter. The analog output can be used as a wave generator of various shapes and variable frequency.

The Rs485 and CAN Bus allow the expansion of the system, using any of the Ledoelectronics expansion modules or any standard module.

The presence of a color graphic display with a resolution of 480x800, with built-in touch screen, increases the versatility of the board. The libraries supplied with the module make the difficult simple, and allow the representation of characters, images and figures by simple commands with `drawBitmap(..)`, `printChar(..)`, `printString(...)`, `drawLine(..)`, `drawRect(..)`, `drawCircle(..)`, etc.

Using a Windows application, supplied with the board, the images can be transferred from a PC to the Flash memory of the board through the USB bus.

Electronic diagrams of SAM Tft4.0 Touch module

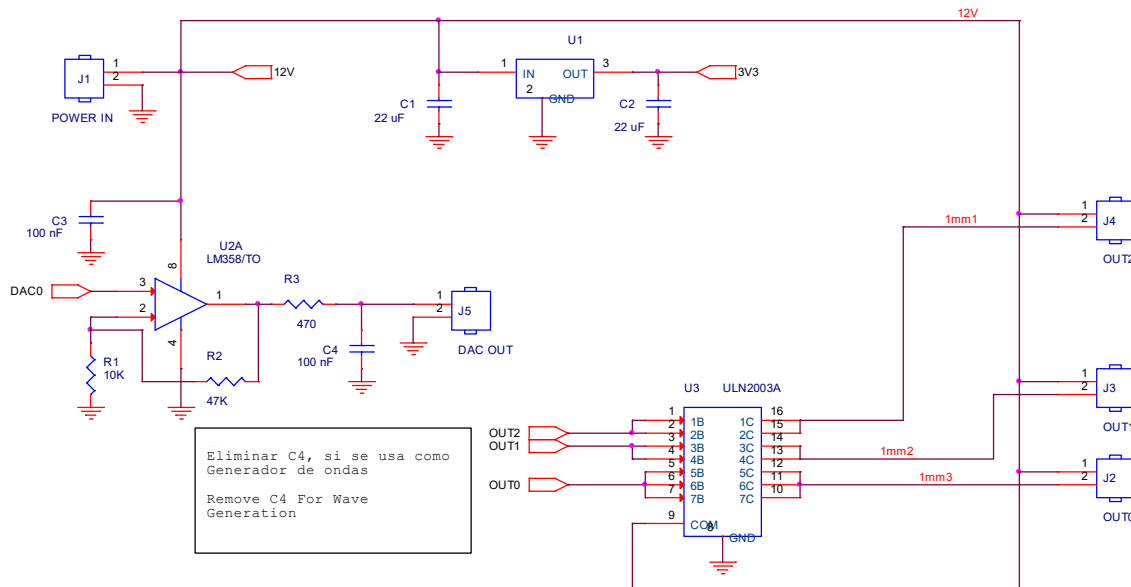


Fig.1. Power supply and Outputs.

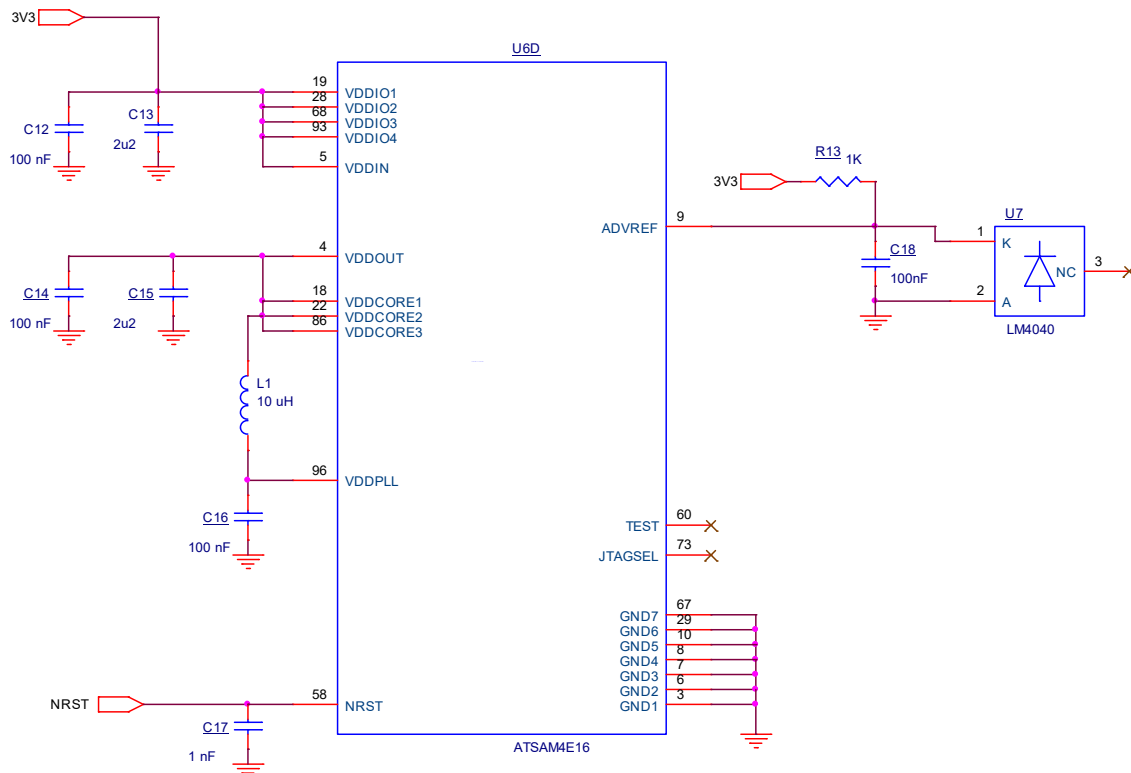


Fig.2. CPU Core.

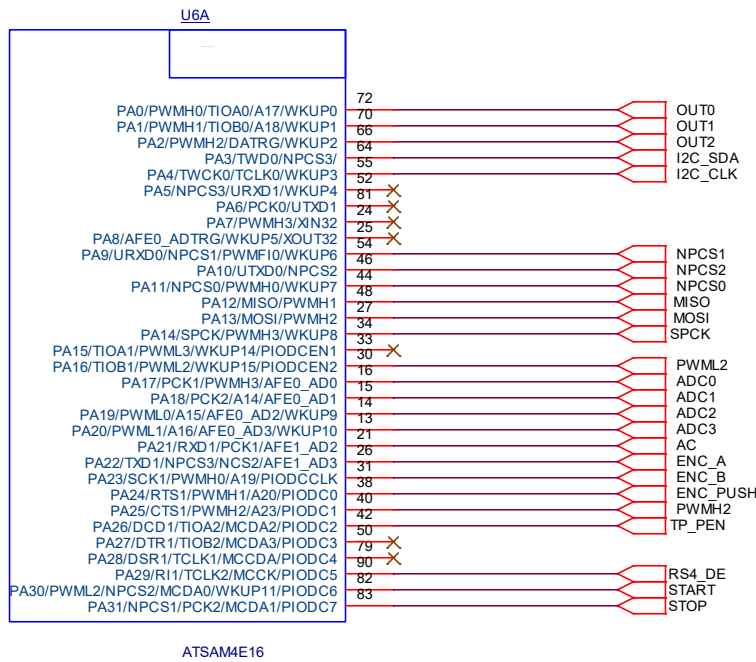


Fig.3. CPU PIOA

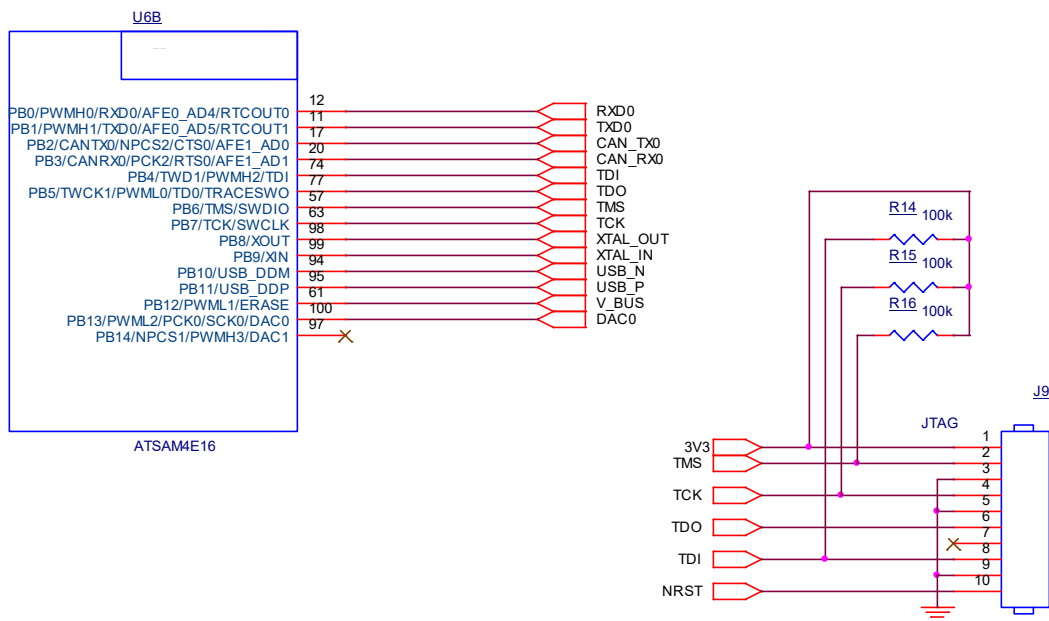
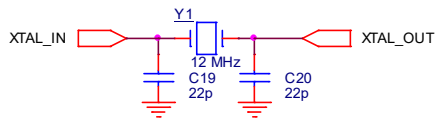


Fig.4. CPU PIOB

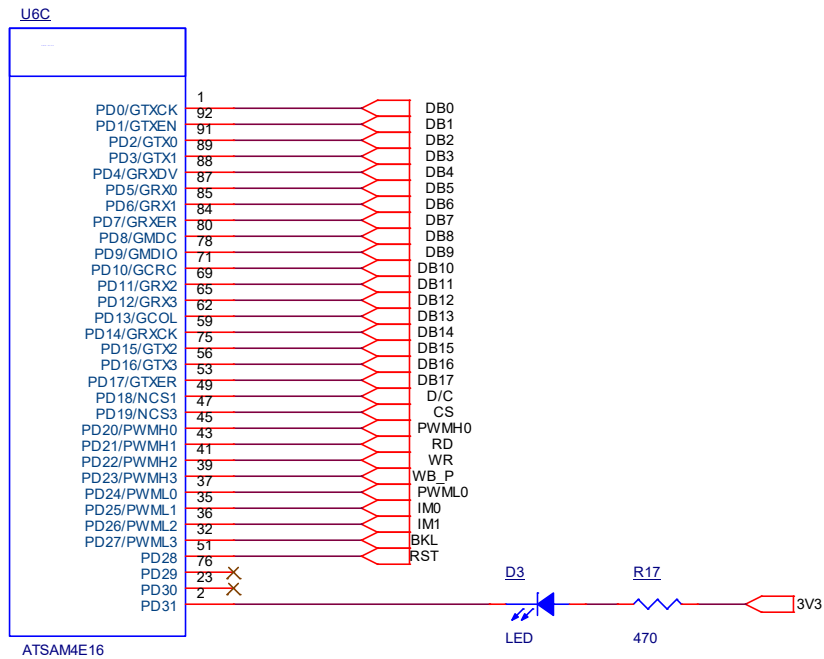


Fig.5. CPU PIOD

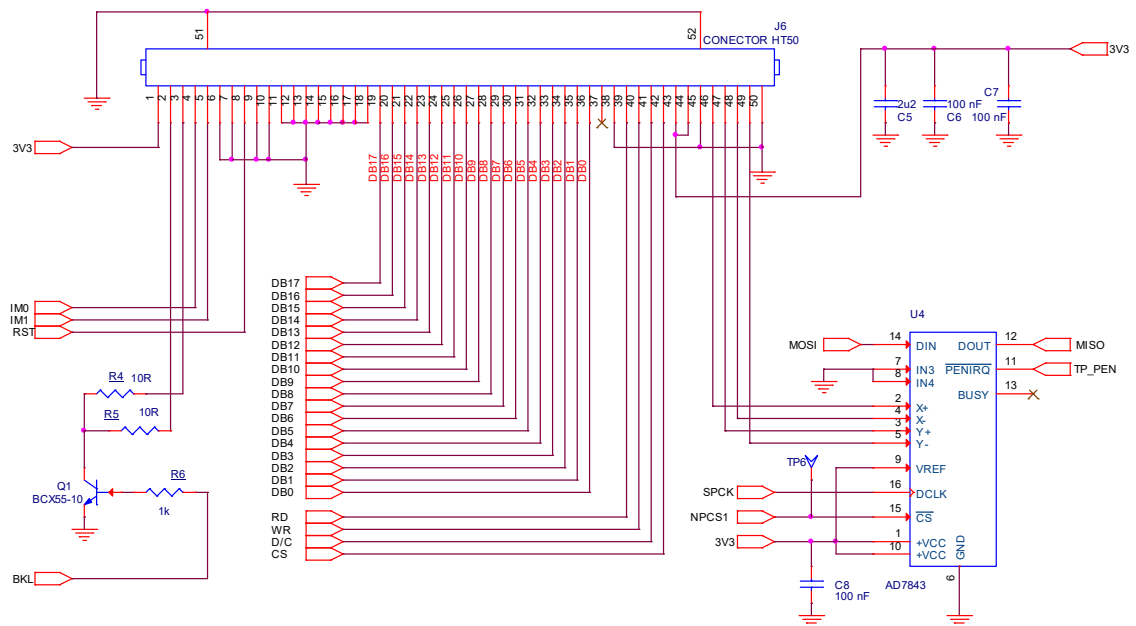


Fig.6. TFT and Touch Panel Controller.

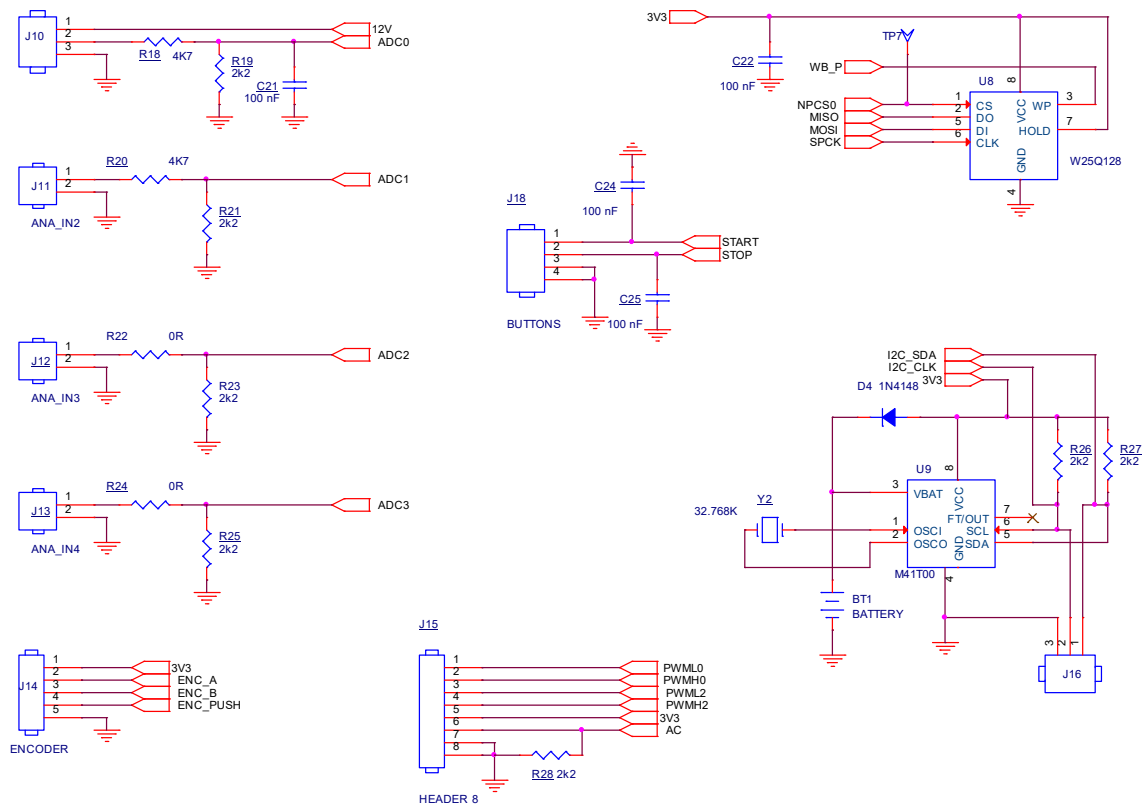


Fig.7. Connectors, RTC and External Flash.

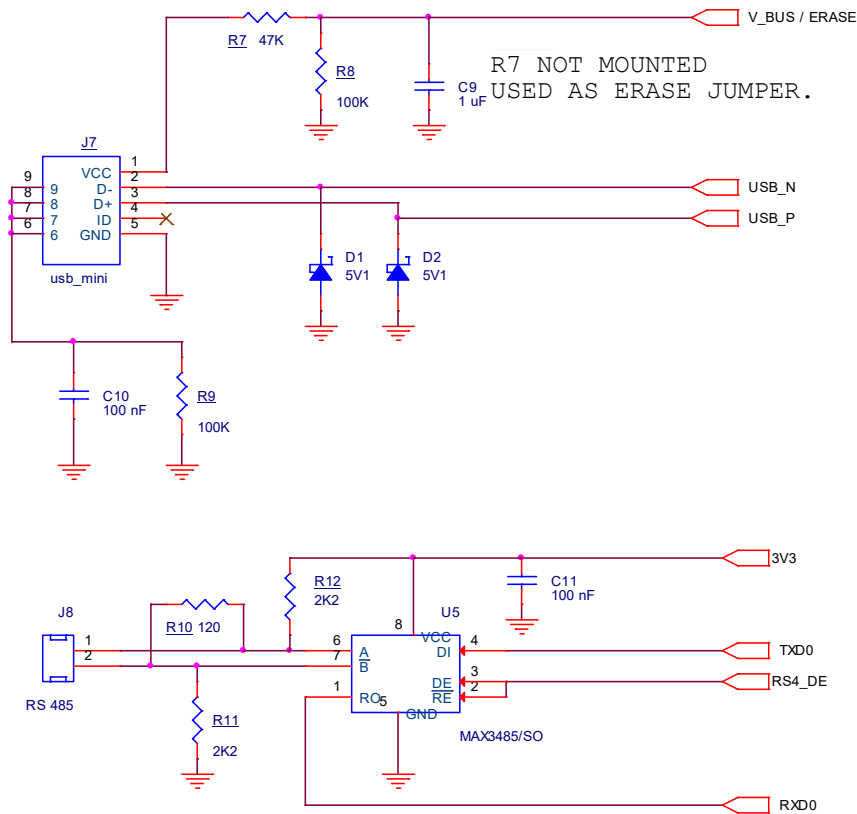


Fig.8. USB and Rs485 Communications.

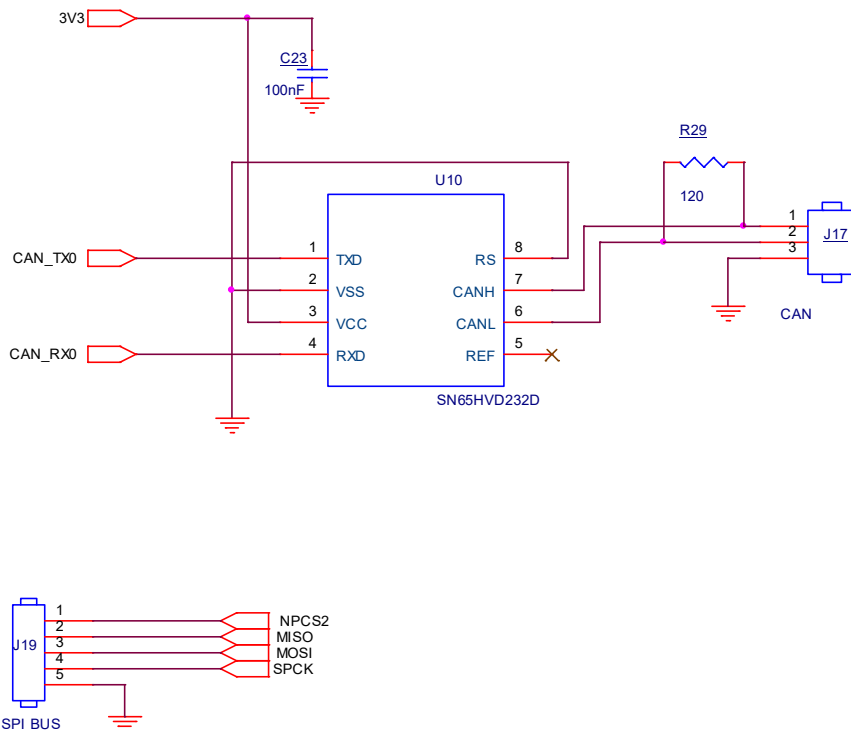


Fig.10. SPI Interface Connector.

Programming

The Program, compiled in the free IDE Atmel Studio 6xx - 7xx, or any other IDE can be transferred to the microcontroller, without the need of any programmer. Through the free utility SAM-BA Bootloader, downloadable from the Microchip website, only a mini USB cable is required to connect it to the PC.

The board is also compatible with Atmel programmers, such as the Atmel-ICE, through the 10-pin J9 JTAG / SW connector.

The SAM4E-16C can be brought into Bootloader mode, hardware (Erase jumper) and software, using Ledoelectronics utility Sam_tft_flash_prog.exe.

Expansion modules

The following expansion modules are available, compatible with the SAM_TFT4.0_TOUCH control system:

- Stepper motor control module (RS485).
- Control Module stepper motor (CAN Bus).

- Module with three temperature PID controllers (CAN Bus).
- CAN_IO Board inputs / outputs expander. 16 inputs and 18 digital outputs 0 / 24V DC.

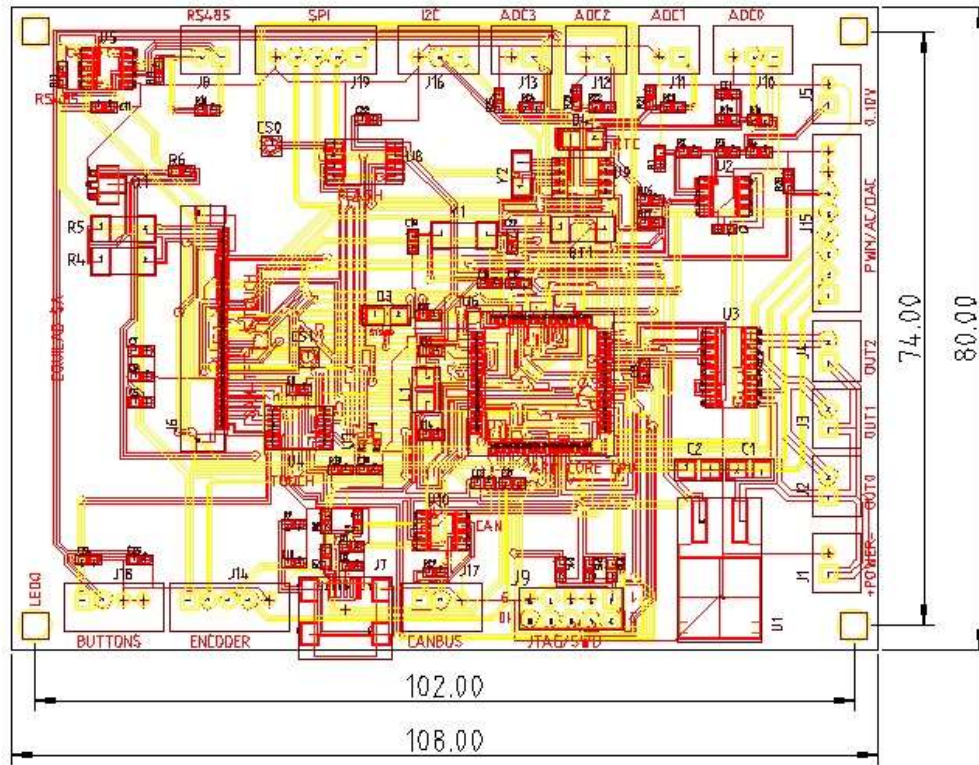


Fig.6. Board outline.