User manual

Nano Board with STM32F303CCT6 MCU

Introduction

The Nano board allows users to easily develop applications with the STM32F303CCT6 microcontroller with the Arm Cortex-M4 32-bit core.

Based on STM32F303CCT6, it includes one MPU6050 (is a 3-axis gyroscope and a 3-axis accelerometer sensor), LEDs, push-buttons and a mini USB port.

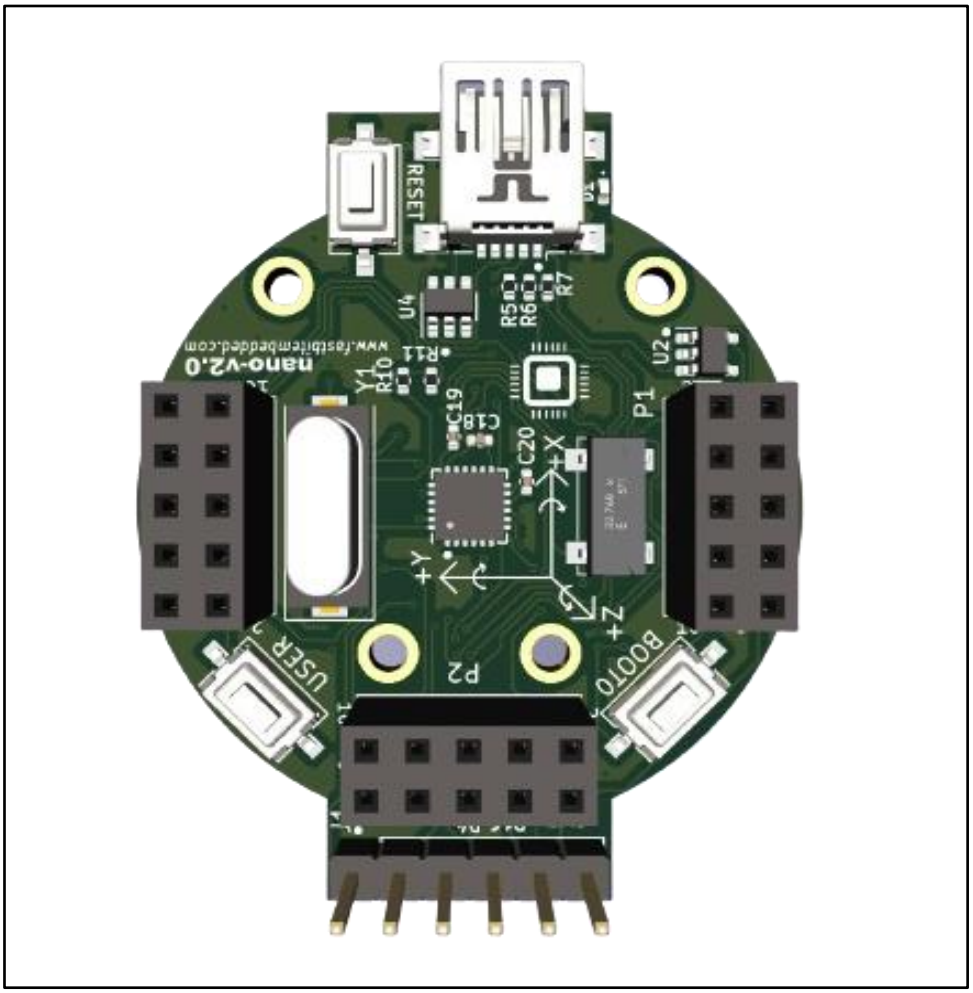

Figure 1: Nano

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List of abbreviation

SWD	Serial Wire Debug
LQFP	Low Profile Quad Flat Package
LSE	Low Speed External
HSE	High Speed External

Feature:

The Nano offers the following features:

- The STM32F303CCT6 microcontroller features a 32-bit Arm Cortex-M4 with FPU core (72 MHz max), 256-Kbyte Flash memory, and 48-Kbyte SRAM in a LQFP48 package.
- Three push buttons:
    - SW1(reset), SW2(user button), SW3(boot0).
- Four LEDs:
    - D1 (red) for 3.3 V power on / off.
    - Three user LEDs, D2 (blue), D3 (green), D4 (red).
- Board connectors:
    - J1 SWD.
    - J2 USB-B Micro.
    - 2.54 mm pitch extension header for 30 pins of LQFP48 I/Os for quick connection to prototyping board and easy probing.
- Power-supply options: ST-LINK or USB VBUS.

Hardware and layout

The Nano is designed around the STM32F303CCT6 microcontroller in a 48-pin LQFP package.

Figure 2 and Figure 3 help users to locate STM32F303CCT6 and its peripherals (MPU6050, push buttons, LEDs).

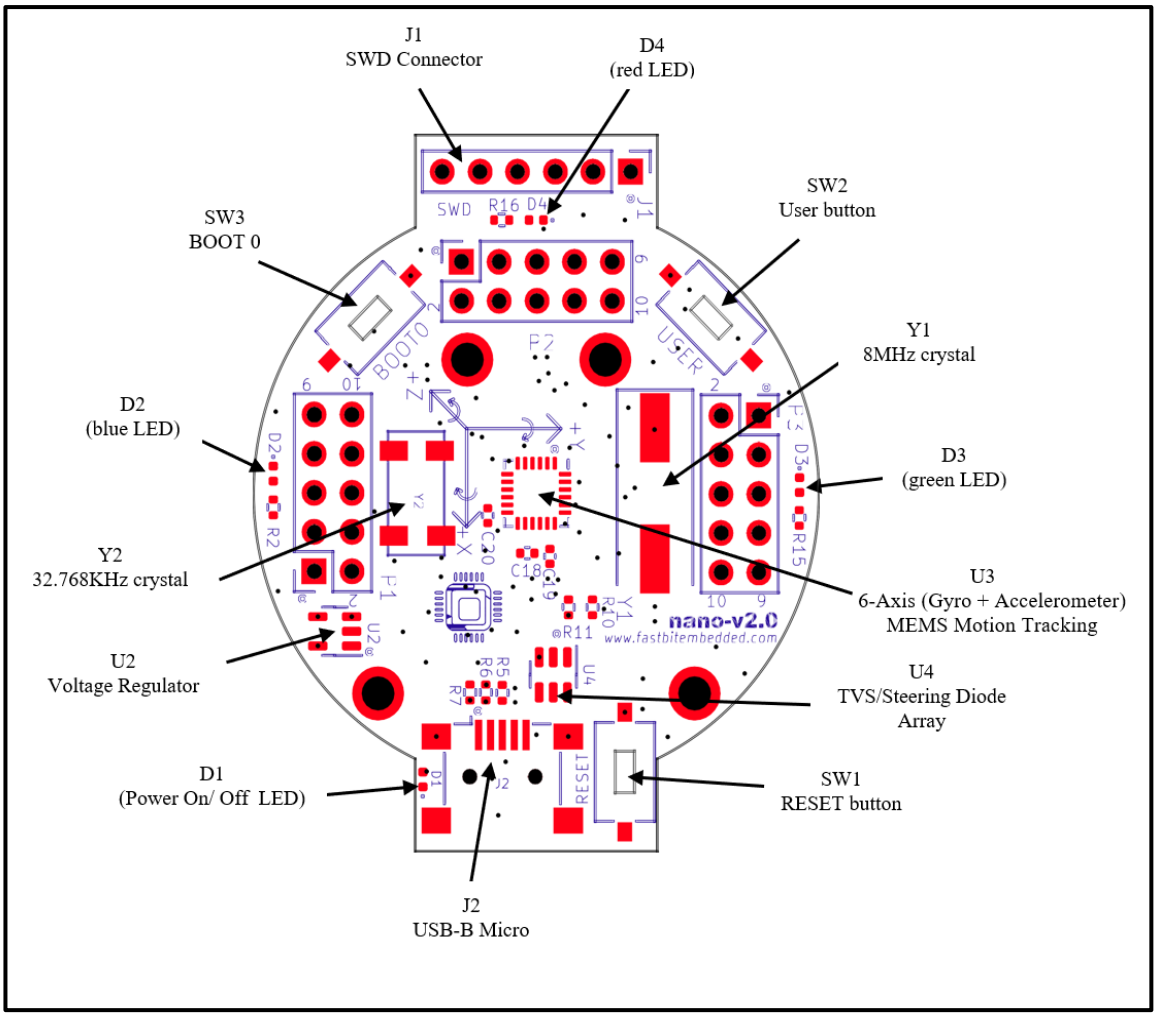


Figure 2: Nano top layout

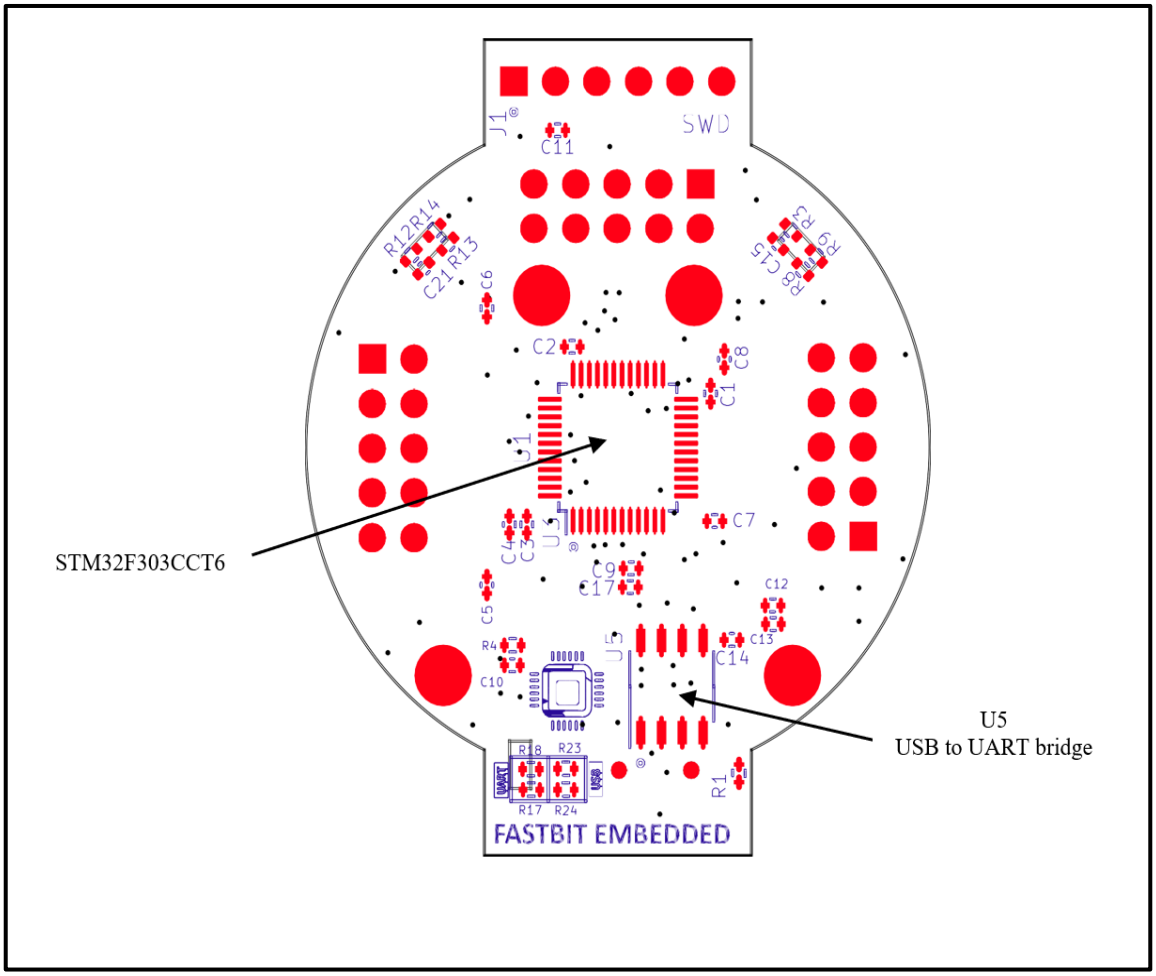


Figure 3: Nano bottom layout

Power supply and power selection

- The power supply is provided either by the host PC through the USB cable or via the SWD port using an ST-Link connection.
    - U2 regulates the 5V input from USB to provide a steady 3.3V output.

Note: Don't connect external power supply to header sockets.

LEDs

- D1 PWR: red LED indicates that the board is powered.
- User D2: blue LED is a user LED connected to the I/O PA1 of the STM32F303CCT6.
- User D3: green LED is a user LED connected to the I/O PA2 of the STM32F303CCT6.
- User D4: red LED is a user LED connected to the I/O PA3 of the STM32F303CCT6.

Push buttons

- SW1 RESET: Push button connected to NRST is used to RESET the STM32F303CCT6.
- SW2 USER: User button is connected to the I/O PA0 of the STM32F303CCT6.
- SW3 BOOT0: Push button connected to BOOT0 is used to toggle the boot mode of the STM32F303CCT6.

BOOT0	Boot Mode
0	Main flash memory
1	System memory

Table 1: Boot modes

Note: By default, the microcontroller runs the application code from the main flash memory. To change this behavior, use the BOOT0 button.

1. Press and hold the BOOT0 button and then press the reset button.
2. This action makes the microcontroller to run the built-in bootloader from the system memory (i.e., microcontroller enters the bootloader mode).

6-Axis (Gyro + Accelerometer) MEMS Motion Tracking

- MPU6050 sensor is a low power, low cost, and high-performance 6-axis (Gyro + Accelerometer).
- The MPU6050 devices combine a 3-axis gyroscope and a 3-axis accelerometer on the same silicon die, together with an onboard Digital Motion Processor (DMP), which processes complex 6-axis Motion Fusion algorithms.
- The STM32F303CCT6 microcontroller controls this sensor through the I2C interface.

OSC Clock

- **LSE: OSC 32.768 kHz clock supply**

  Refers to an external oscillator running at 32.768 kHz. It typically provides a low-frequency clock source for real-time clocks (RTC) or other timing-sensitive functions.

Pin Name	Pin Function
PC14	OSC32_IN
PC15	OSC32_OUT

Table 1: LSE pins

- **HSE: OSC 8 MHz clock supply**

Refers to an external oscillator running at 8MHz. It provides a higher-frequency clock source suitable for driving the core processing unit or other high-speed peripherals.

Pin Name	Pin Function
PF0	OSC_IN
PF1	OSC_OUT

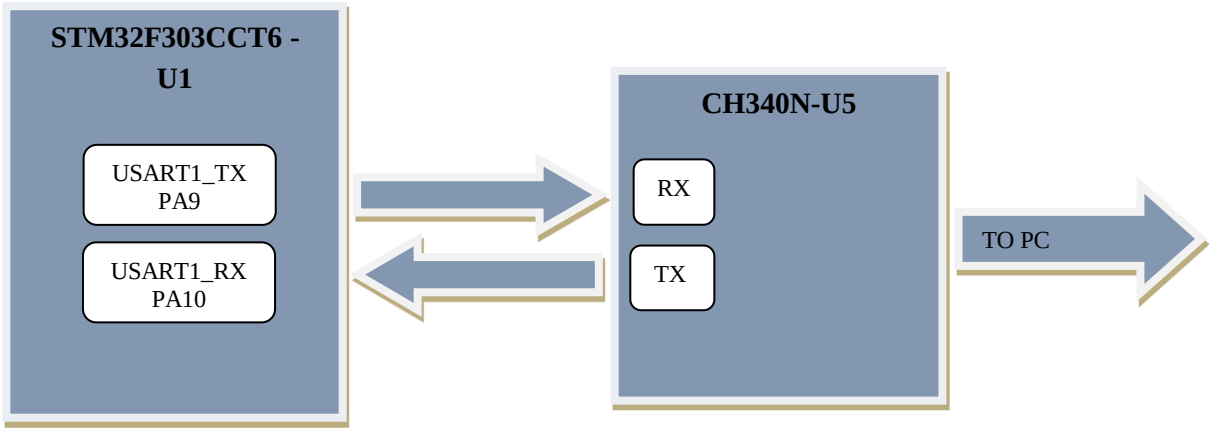
Table 2: HSE pins

USB to UART bridge

- The USB to UART bridge facilitates communication between a computer and a STM32F303CCT6, with UART1Tx and UART1Rx serving as the transmit and receive pins, respectively, connected to pins PA9 and PA10 on the microcontroller.

Pin Name	Pin Function
PA9	UART1_Tx
PA10	UART1_Rx

Table 3: UART1 pins



Block1: UART-USB Bridge

Programming Nano Board

1. **Using boot loader** (ST-Link not required)**:**
   - Power the board via USB.
   - Press and hold the BOOT0 button and then press the reset button.
   - Open STM32CubeProgrammer and connect to the board by selecting UART/USB.
   - Open a .elf file and download the program to the board.
   - Reset the board to run the code.

Note: You cannot debug the code using this method for further information follow the link .

2. **Using ST-Link:**
   - Connect the ST-Link to the board via SWD interface.

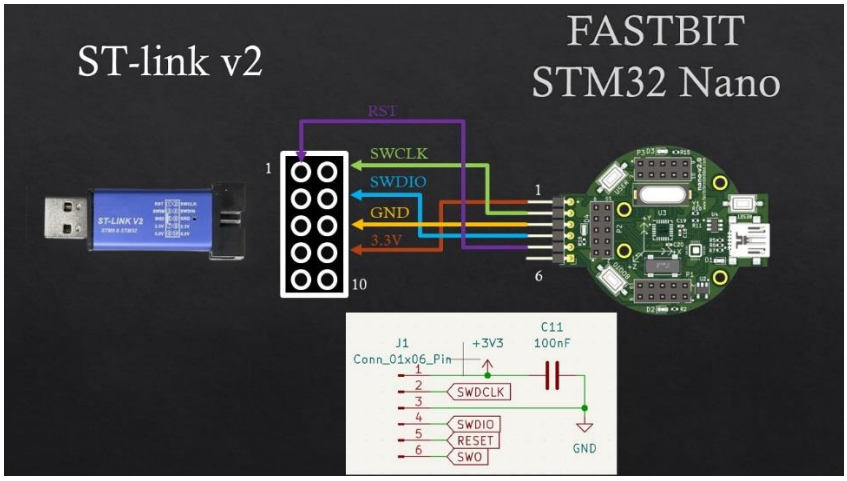


Figure 4: ST-link V2 to Nano board connection

   - Power the board via USB or ST-Link, depending on the setup.
   - Open STM32CubeIDE or any other compatible IDE.
   - Configure the IDE to use ST-Link as the debugging interface.
   - Build your project or open a .elf file.
   - Use the IDE to download the program to the board.
   - Use the IDE's "Debug" option to debug the program, or the "Run" option to execute the program without debugging.