# Mini Project#2: RedBot racing along the circle in two black tracks

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# Mini Project Description

| Title | AVR Functions | Additional H/W | S/W Scenario |
|---|---|---|---|
| Run 3 Times Round Circle | I2C, USART | BNO055 orientation sensor | Based on positioning of sensor move a line in 3D space |

Requirement

- Two students will form a team and share one sensor

- Prove your understanding of AVR design capability

- Schedule:

- Lab demo and competition (5/06)
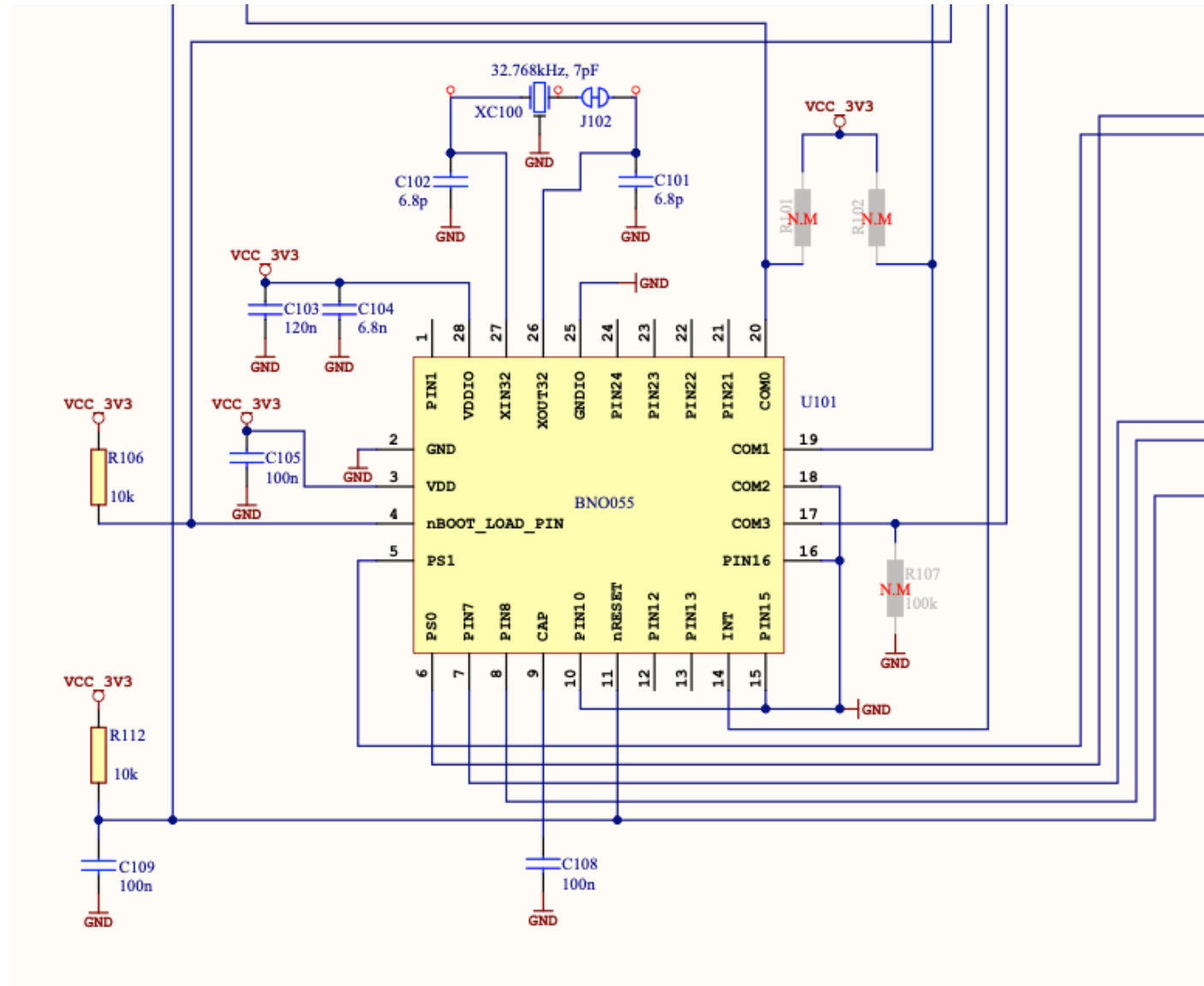
# Mini Project: 3D joystick

Description

- Using Atmel's BNO055 Xplained Pro board, you will implement a 3D-joystick.

- Calculate X,Y,Z positioning based on angular position of board.
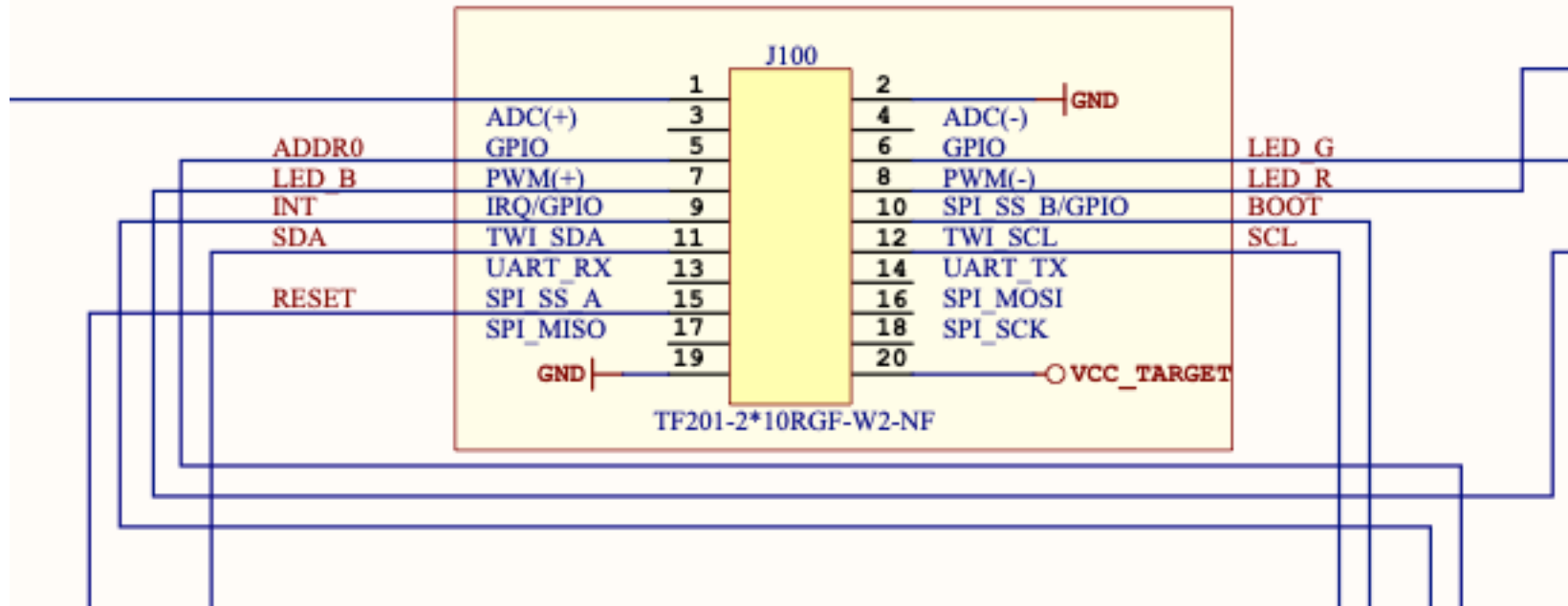
- Send data through UART to MATLAB to display



https://www.microchip.com/DevelopmentTools/ProductDetails/ATBNO055-XPRO

# BNO055 Board Schematic (1/2)

# BNO055 Board Schematic (2/2)



**Standard Extension Header (Female)**

J100

| | | | | |
|---|---|---|---|---|
| | 1 | 2 | | GND |
| ADC(+) | 3 | 4 | ADC(-) | |
| ADDR0 | GPIO | 5 | 6 | GPIO | LED_G |
| LED_B | PWM(+) | 7 | 8 | PWM(-) | LED_R |
| INT | IRQ/GPIO | 9 | 10 | SPI_SS_B/GPIO | BOOT |
| SDA | TWI_SDA | 11 | 12 | TWI_SCL | SCL |
| | UART_RX | 13 | 14 | UART_TX | |
| RESET | SPI_SS_A | 15 | 16 | SPI_MOSI | |
| | SPI_MISO | 17 | 18 | SPI_SCK | |
| GND | 19 | 20 | VCC_TARGET | |

TF201-2*10RGF-W2-NF

# Mini project approach

How do we start?

• Read carefully the BNO055 datasheet

• Understand the I2C/UART protocol to communicate with the BNO055

• Understand the different modes of operation of the BNO055

• Figure out how to convert BNO055 output to X angle

• Additional algorithm for RedBot run around the circule

# Mini project#2

It requires a task-base programming with your redbot to follow a circle of a set radius. Not only using your redbots IR sensor, but also you need to use **BNO055** sensor to follow the circle. Your redbot will need to be able to read the lateral angle of the compass through the BNO055, and then decide how fast it needs to drive each wheel to drive in a circle of a certain radi 1 times.

Since we only need to consider one plane of motion, basic geometry is all that is required to achieve this. You will not know the radius of the circle until you demo your redbot, so your calculations should work with any distance.