



DesignNews

IoT Designs Using STmicro Microcontrollers

Day 2:

Microchip Meets NUCLEO

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Webinar Logistics

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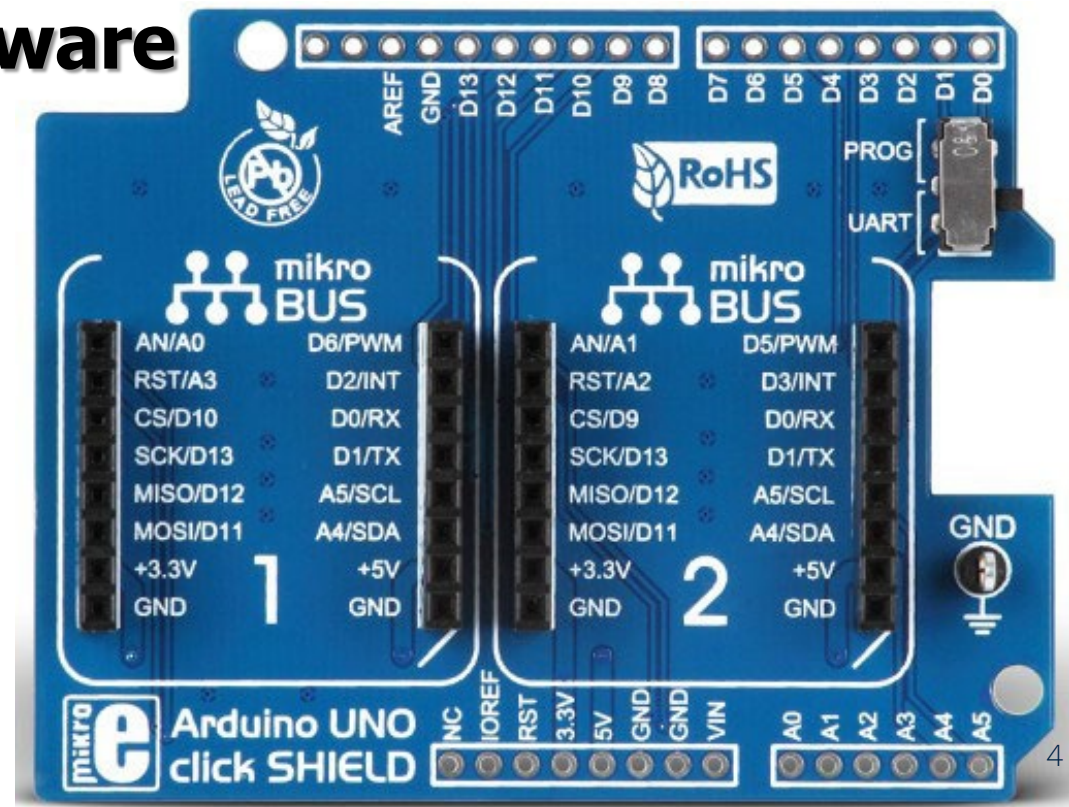


Fred Eady

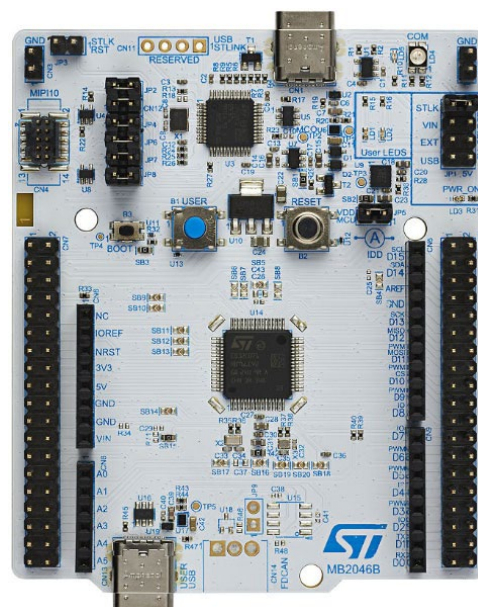
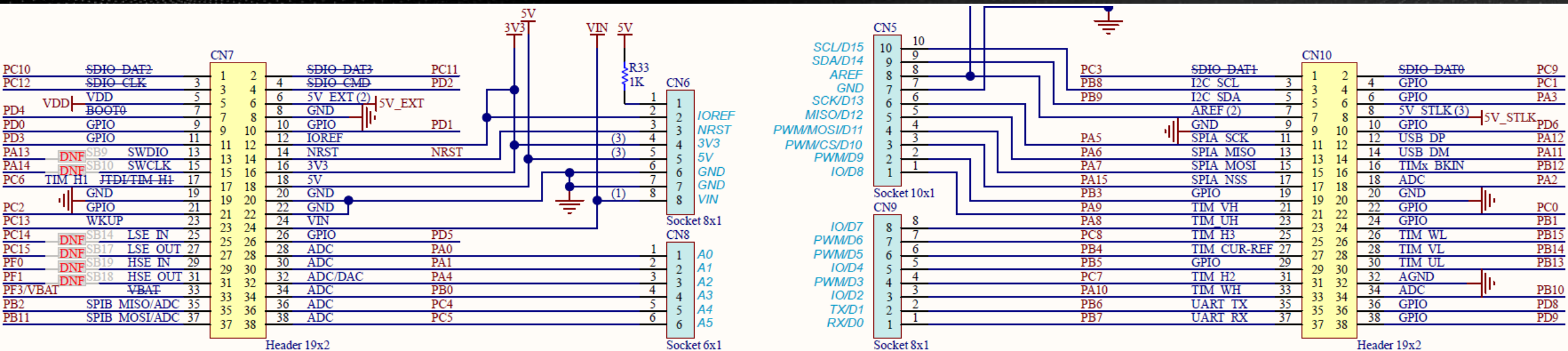
Visit 'Lecturer Profile' in your console for more details.

AGENDA

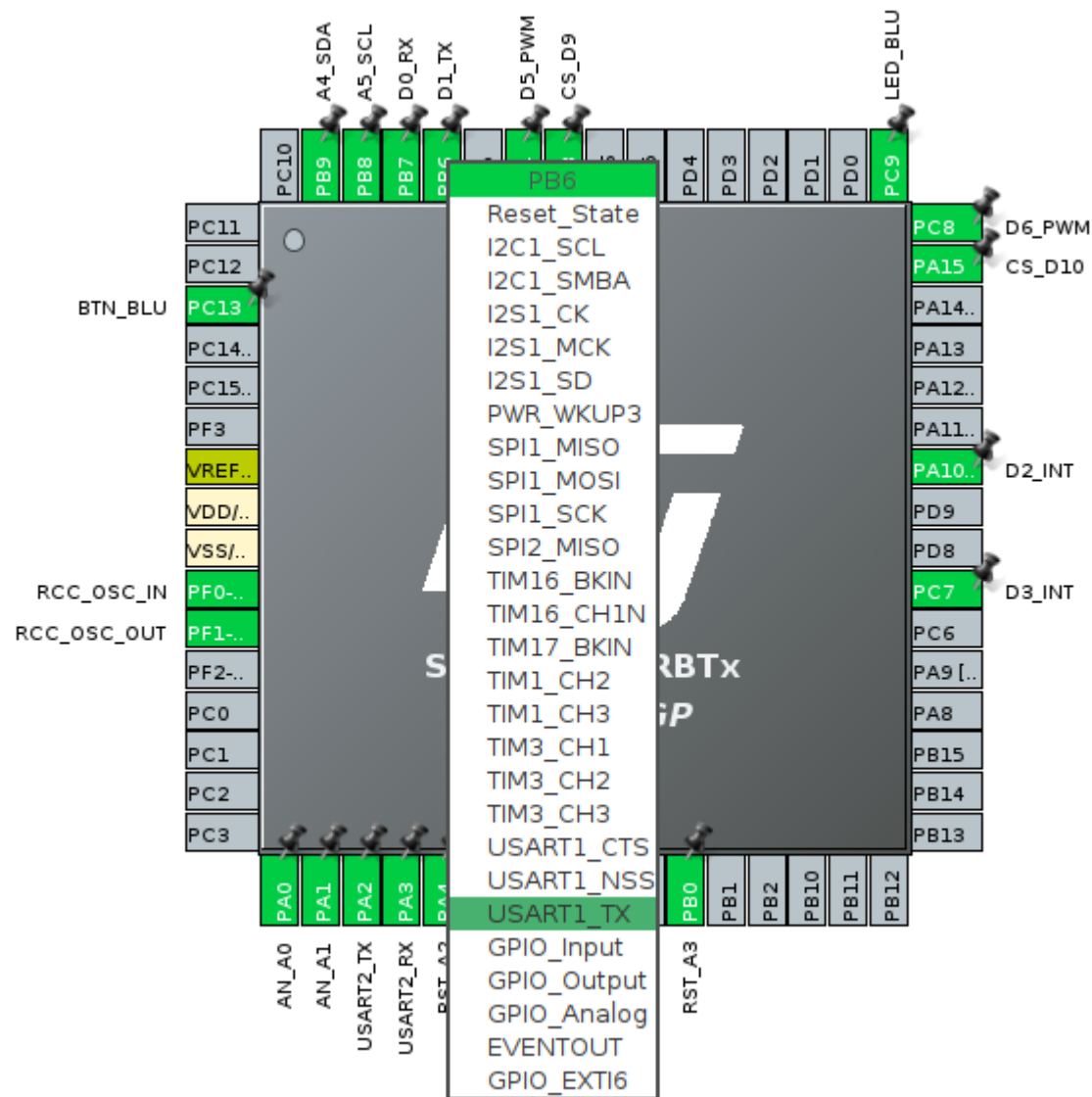
- **NUCLEO-C071RB/Arduino UNO click SHIELD Setup**
 - **STM32C071RB Pin Configuration**
 - **Arduino UNO click SHIELD Hardware Modification**
- **Code an RN4871 Driver**
 - **Update the RN4871 click Firmware**
 - **Code the RN4871 click Driver**
 - **Test the RN4871 click Driver**



STM32C071RB Pin Configuration



STM32C071RB Pin Configuration



STM32C071RB Pin Configuration - GPIO

Pinout & Configuration

Search

Categories A->Z

System Core

- CORTEX_M0+
- DMA
- FLASH
- GPIO
- IWDG
- NVIC
- RCC
- SYS
- WWDG

Analog

Timers

Connectivity

- I2C1
- I2C2
- IRTIM
- SPI1
- SPI2
- USART1
- USART2
- USB

Multimedia

Computing

Clock Configuration

Software Packs

Pinout

GPIO Mode and Configuration

Configuration

Group By Peripherals

GPIO ADC I2C RCC SPI USART

Search Signals

Search (Ctrl+F)

☐ Show only Modified Pins

Pin N...	Signal on...	GPIO out...	GPIO mode	GPIO Pull...	Maximu...	Fast Mode	User Label	Modified
PA4	n/a	High	Output P...	No pull-u...	High	n/a	RST_A2	☒
PA10 [PA...	n/a	Low	Output P...	No pull-u...	High	Disable	D2_INT	☒
PA15	n/a	High	Output P...	No pull-u...	High	n/a	CS_D10	☒
PB0	n/a	High	Output P...	No pull-u...	High	n/a	RST_A3	☒
PB3	n/a	High	Output P...	No pull-u...	High	n/a	CS_D9	☒
PB4	n/a	n/a	Input mo...	No pull-u...	n/a	n/a	D5_PWM	☒
PC7	n/a	n/a	Input mo...	No pull-u...	n/a	n/a	D3_INT	☒
PC8	n/a	n/a	Input mo...	No pull-u...	n/a	n/a	D6_PWM	☒
PC9	n/a	High	Output P...	No pull-u...	Low	n/a	LED_BLU	☒
PC13	n/a	n/a	Input mo...	No pull-u...	n/a	n/a	BTN_BLU	☒

PA4 Configuration :

GPIO output level High

GPIO mode Output Push Pull

GPIO Pull-up/Pull-down No pull-up and no pull-down

Maximum output speed High

User Label RST_A2

STM32C071RB Pin Configuration - Analog

Pinout & Configuration

Clock Configuration

Project Manager

Software Packs

Pinout

GPIO Mode and Configuration

Configuration

Group By Peripherals

GPIO

ADC

I2C

RCC

SPI

USART

Search Signals

Search (Ctrl+F)

Show only Modified Pins

Pin Name	Signal on Pin	GPIO output level	GPIO mode	GPIO Pull-up/Pull-...	Maximum output...	Fast Mode	User Label	Modified
PA0	ADC1_IN0	n/a	Analog mode	No pull-up and n...	n/a	n/a	AN_A0	☒
PA1	ADC1_IN1	n/a	Analog mode	No pull-up and n...	n/a	n/a	AN_A1	☒

System Core

CORTEX_M0+

DMA

FLASH

GPIO

IWDG

NVIC

RCC

SYS

WWDG

Analog

Timers

Connectivity

STM32C071RB Pin Configuration – I²C

Pinout & Configuration

Clock Configuration

Project Manager

Software Packs

Pinout

GPIO Mode and Configuration

Configuration

Group By Peripherals

GPIO

ADC

I2C

RCC

SPI

USART

Search Signals

Search (Ctrl+F)

Show only Modified Pins

Pin Name	Signal on Pin	GPIO output level	GPIO mode	GPIO Pull-up/Pull-...	Maximum output...	Fast Mode	User Label	Modified
PB8	I2C1_SCL	n/a	Alternate Functio...	No pull-up and n...	Low	Disable	A5_SCL	☒
PB9	I2C1_SDA	n/a	Alternate Functio...	No pull-up and n...	Low	Disable	A4_SDA	☒

System Core

CORTEX_M0+

DMA

FLASH

GPIO

IWDG

NVIC

RCC

SYS

WWDG

Analog

Timers

Connectivity

STM32C071RB Pin Configuration - SPI

10

STM32C071RB Pin Configuration – USART1

11

STM32C071RB Pin Configuration - Interrupts

Pinout & Configuration

Clock Configuration

Project Manager

Software Packs

Pinout

CategoriesA->Z

System Core

- CORTEX_M0+DMAFLASHGPIOIWDG**NVIC**RCCSYSWWDG
- Analog
- Timers
- Connectivity
- Multimedia

NVIC Mode and Configuration

Configuration

✓ NVIC

✓ Code generation

☐ Sort by Preemption Priority and Sub Priority
 ☐ Sort by interrupts names

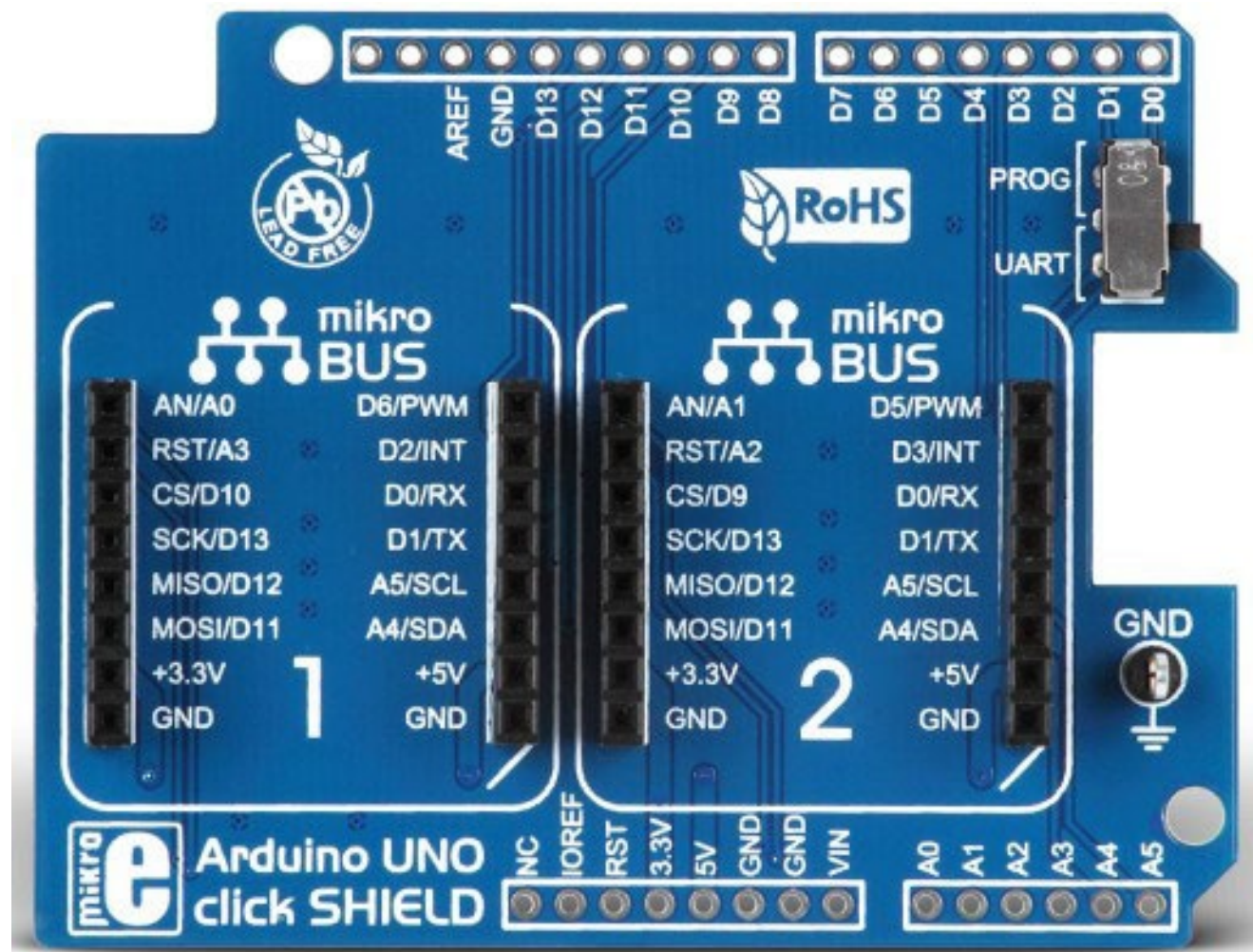
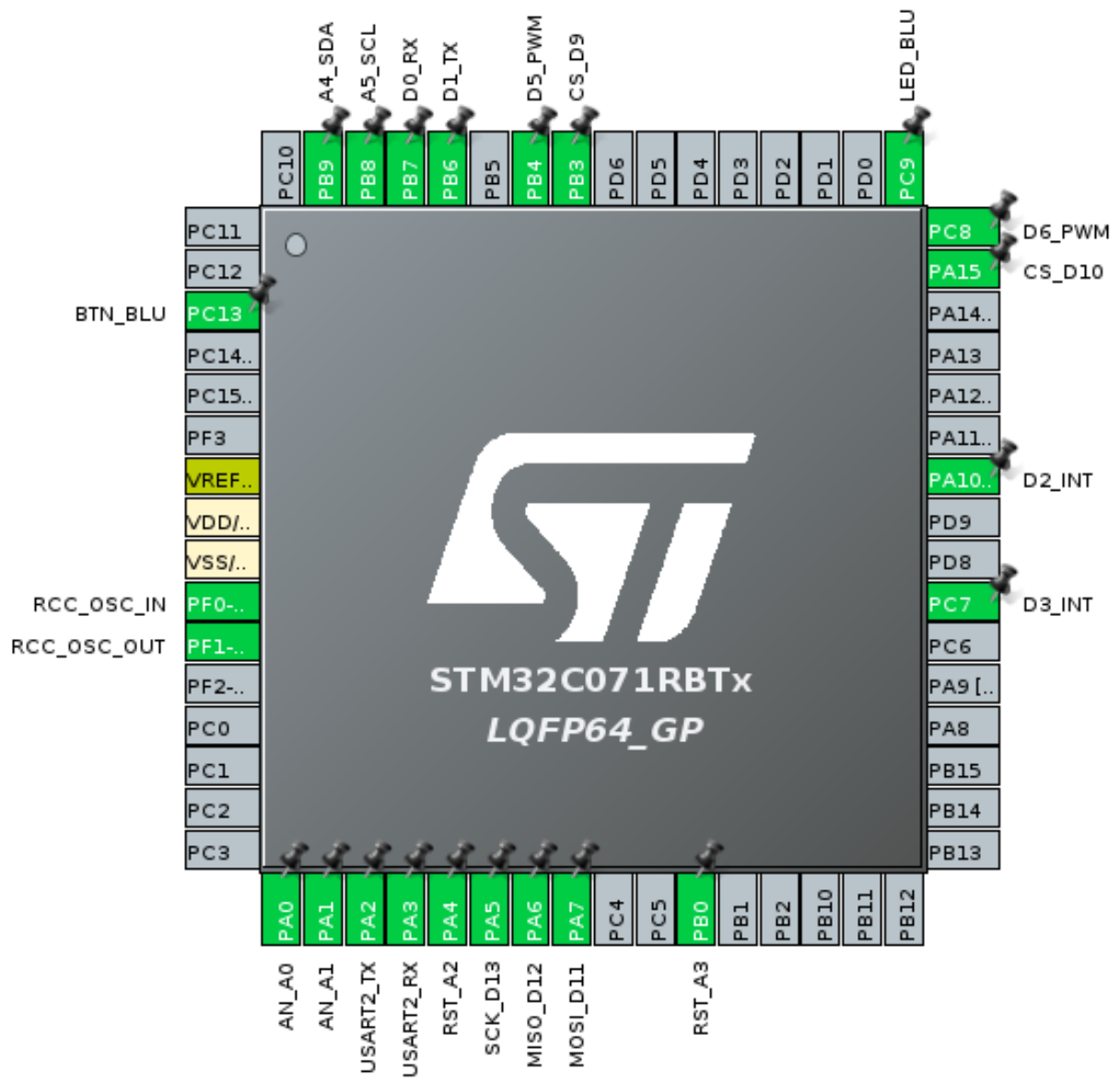
Search

⌕ ⏪ ⏩ Show available interrupts ▾

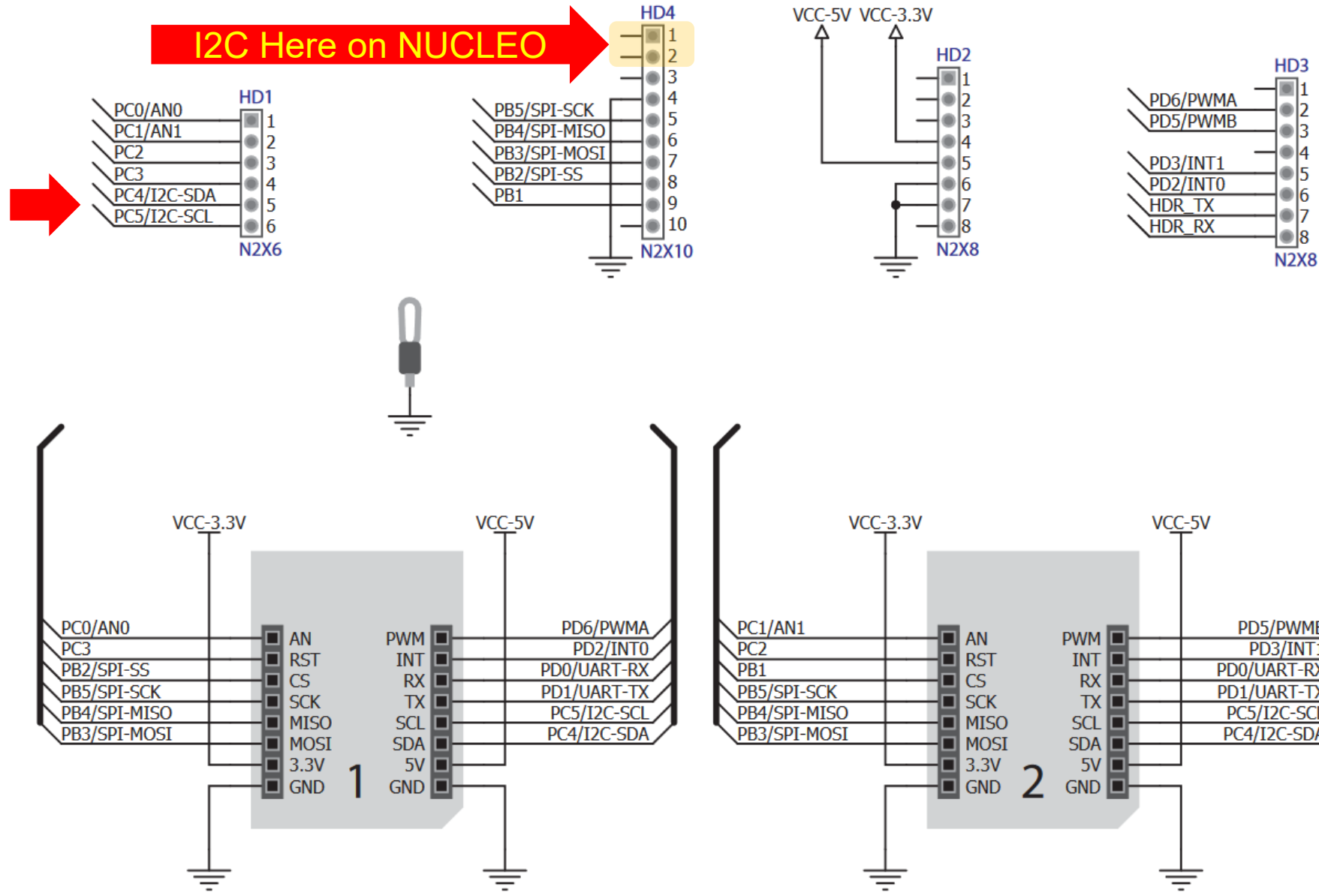
☒ Force DMA channels Interrupts

NVIC Interrupt Table	Enabled	Preemption Priority
Non maskable interrupt	✓	0
Hard fault interrupt	✓	0
System service call via SWI instruction	✓	0
Pendable request for system service	✓	0
Time base: System tick timer	✓	3
Flash global interrupt	☐	0
RCC global Interrupt + CRS global interrupt	☐	0
ADC1 interrupt	☐	0
TIM1 break, update, trigger and commutation interrupts	☐	0
TIM1 capture compare interrupt	☐	0
I2C1 interrupt (combined with EXTI 23)	☐	0
SPI1 interrupt	☐	0
USART1 interrupt	✓	0
USART2 interrupt	☐	0

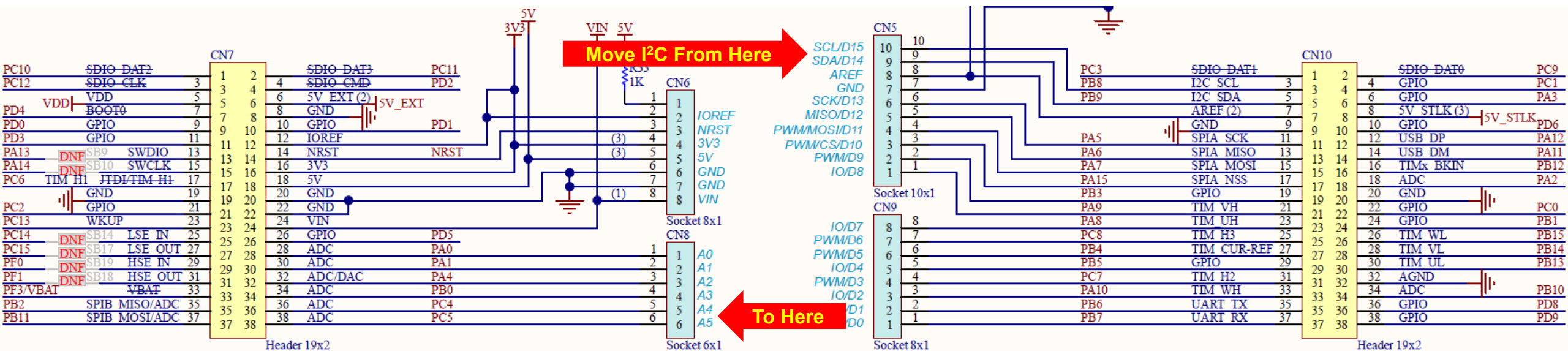
STM32C071RB Pin Configuration – Pin Assignments



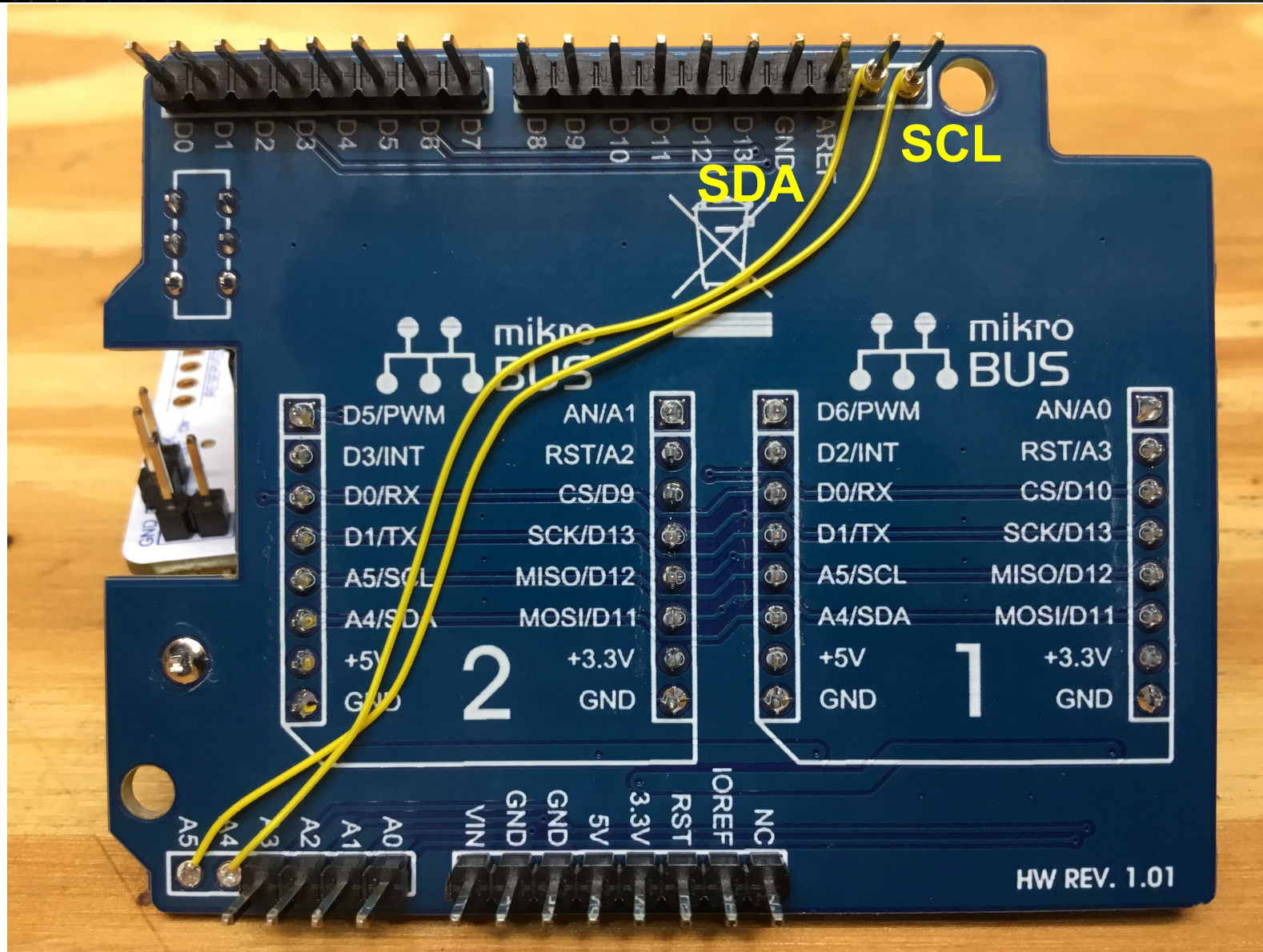
Arduino UNO click SHIELD Hardware Modification



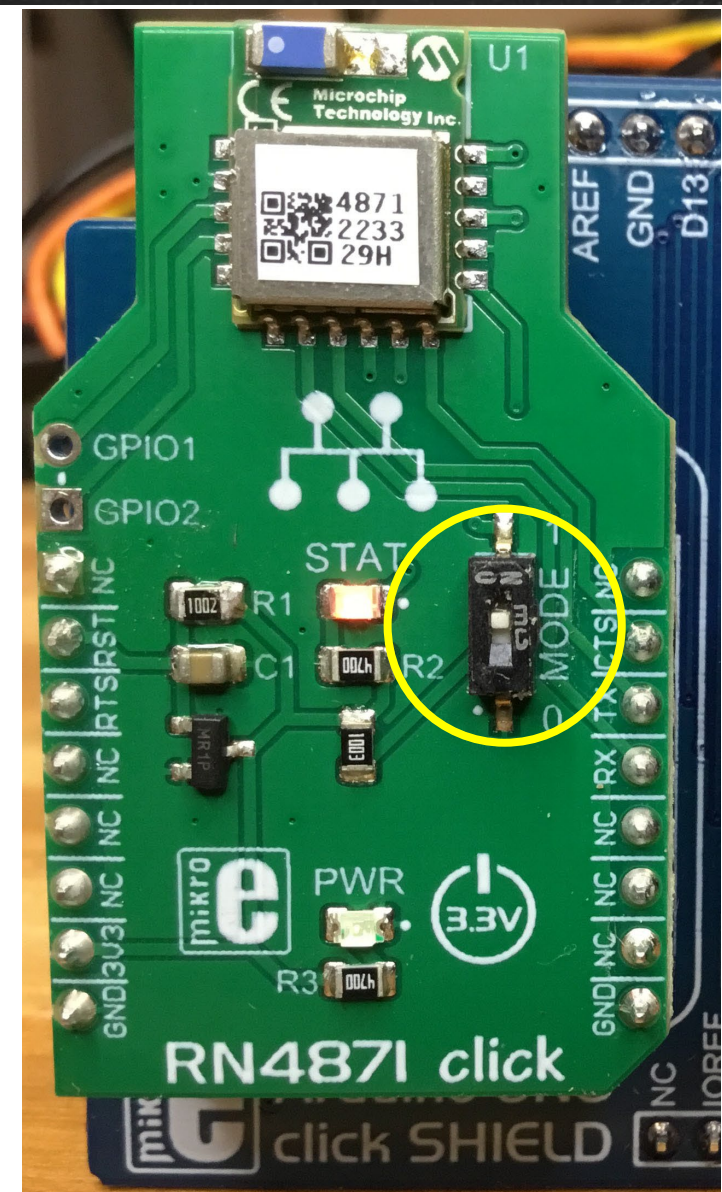
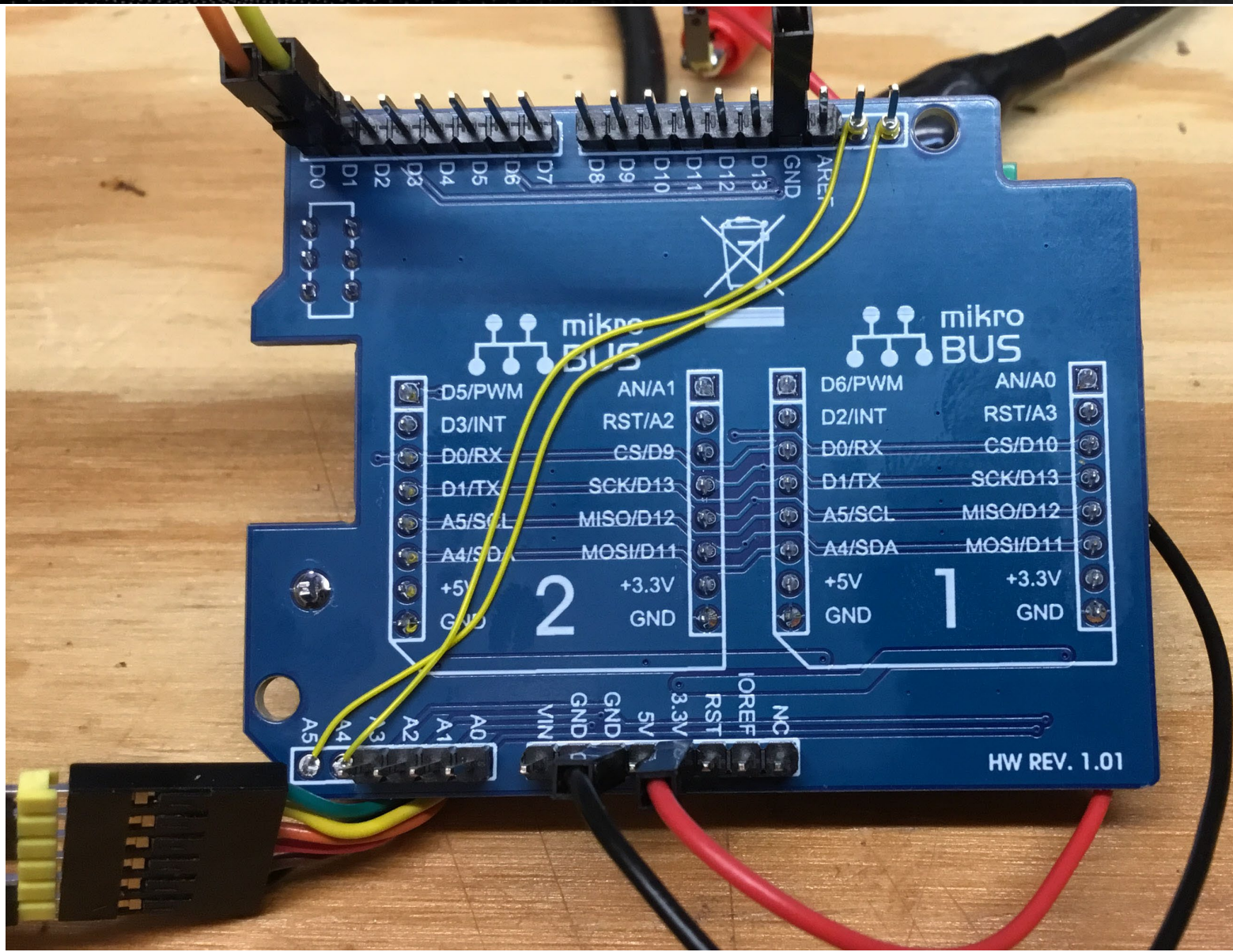
Arduino UNO click SHIELD Hardware Modification



Arduino UNO click SHIELD Hardware Modification



Update the RN4871 click Firmware



Update the RN4871 click Firmware Using isupdate.exe

Access Port

port image num Disconnect

baudrate

Memory Type

memory subtype ☐ EEPROM Speed Up

Code Information/Version

Device Image

Flash Update/Dump

Images Browse Update

Images bank num Browse Dump

Flash/EEPROM/MCU/AHB Access

Address Length(Hex) Data(Hex) Read Write

Browse Write Table

Images Dump Size Dump Table

```
Connect failed
Connect failed
Port connect -> COM31
Start erase Flash... NowTime : October, 28, 14:10:19 Elapse time : 0.000 second
erase Flash success! NowTime : October, 28, 14:10:19 Elapse time : 0.058 second
Start Write Memory 0x0... NowTime : October, 28, 14:10:19 Elapse time : 0.063 second
Start Verify ...
Start Write Memory 0x10000... NowTime : October, 28, 14:10:27 Elapse time : 8.437 second
Start Verify ...
Start Write Memory 0x20000... NowTime : October, 28, 14:10:35 Elapse time : 16.895 second
Start Verify ...
Start Write Memory 0x30000... NowTime : October, 28, 14:10:44 Elapse time : 25.480 second
Start Verify ...
End of Write Memory! Elapse time : 36.639 second
```

Code the RN4871 click Driver – rn4871.h

```

//*****
/** rn4871.h
/** Written by: Fred Eady
/** Last Update: 10-26-2024
/** Notes:
//*****

#ifndef INC_RN4871_H_
#define INC_RN4871_H_

#include "stm32c0xx_hal.h"
#include <string.h>
#include <stdint.h>
#include "main.h"

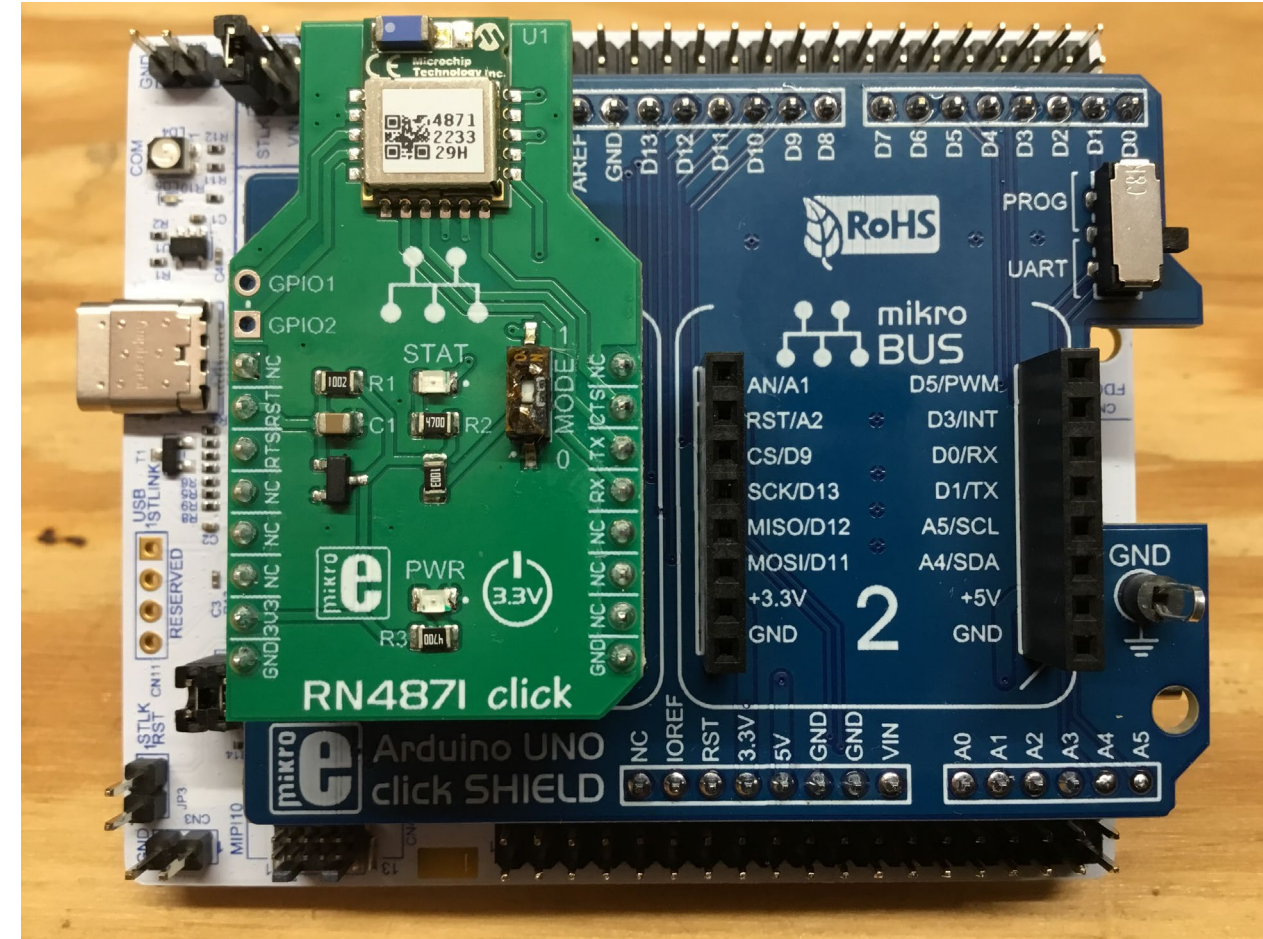
#define click1 1
#define click2 2

//*****
/** Function Prototypes
//*****

void rn4871_init(uint8_t click_position);
void recvPkt(void);
void sendPkt (void);

#endif /* INC_RN4871_H_ */

```



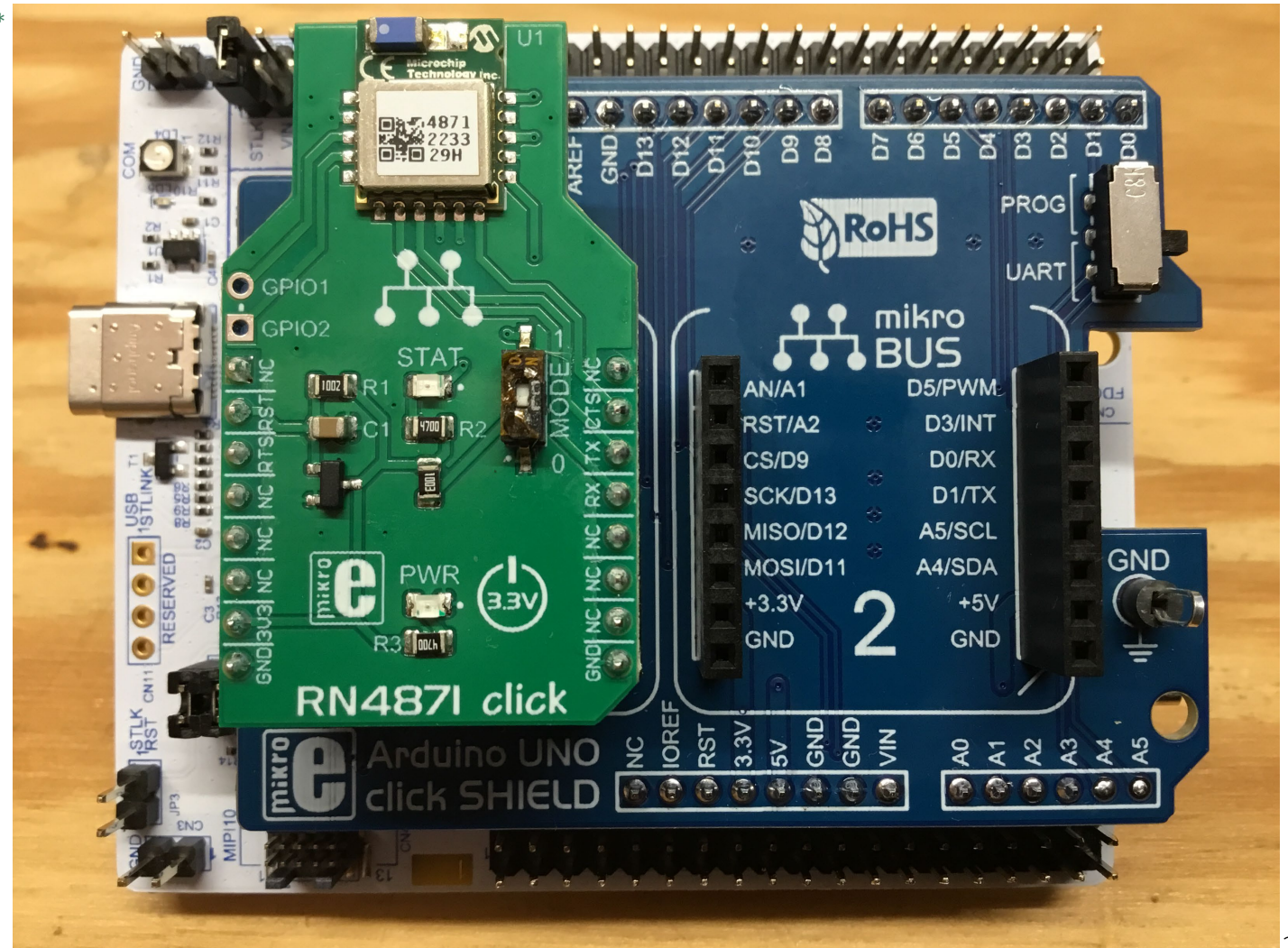
Code the RN4871 click Driver – rn4871.c

```

//*****
/** Initialize the RN4871
//*****
void rn4871_init(uint8_t click_position)
{
    // reset the RN4871
    switch(click_position)
    {
        case 1:
            HAL_GPIO_WritePin(RST_A3_GPIO_Port, RST_A3_Pin, GPIO_PIN_SET);
            HAL_Delay(1000);
            HAL_GPIO_WritePin(RST_A3_GPIO_Port, RST_A3_Pin, GPIO_PIN_RESET);
            HAL_Delay(100);
            HAL_GPIO_WritePin(RST_A3_GPIO_Port, RST_A3_Pin, GPIO_PIN_SET);
            HAL_Delay(200);
            break;
        case 2:
            HAL_GPIO_WritePin(RST_A2_GPIO_Port, RST_A2_Pin, GPIO_PIN_SET);
            HAL_Delay(1000);
            HAL_GPIO_WritePin(RST_A2_GPIO_Port, RST_A2_Pin, GPIO_PIN_RESET);
            HAL_Delay(100);
            HAL_GPIO_WritePin(RST_A2_GPIO_Port, RST_A2_Pin, GPIO_PIN_SET);
            HAL_Delay(200);
            break;
    }
    // Factory Reset
    HAL_Delay(200);
    cmd[0] = '$';
    cmd[1] = '$';
    cmd[2] = '$';
    HAL_UART_Transmit(&huart1,cmd,0x03,0xFFFFFFFF);
    HAL_Delay(200);

    cmd[0] = 'S';
    cmd[1] = 'F';
    cmd[2] = ',';
    cmd[3] = '1';
    cmd[4] = '\n';
    HAL_UART_Transmit(&huart1,cmd,0x05,0xFFFFFFFF);
    HAL_Delay(2000);

```



Test the RN4871 click Driver

The screenshots illustrate the steps to connect and test the RN4871 click driver using a mobile application. The interface includes a 'Devices' list, a 'CONNECT' button, and a 'Write value' dialog box.

Step 1: Discovering the Device

The first screenshot shows the 'Devices' list with the following entries:

- N/A (E2:73:E7:73:DC:C1) NOT BONDED -70 dBm ↔ 101 ms
- N/A (iBeacon) (0A:FD:85:86:80:7D) NOT BONDED -86 dBm ↔ 101 ms
- RN4871-46B1** (44:B7:D0:26:46:B1) NOT BONDED -67 dBm ↔ 970 ms
- N/A (iBeacon) (0D:51:2D:B0:53:FE) NOT BONDED -69 dBm ↔ 102 ms
- N/A (7E:57:58:BC:F4:F5) NOT BONDED -88 dBm ↔ 207 ms

A red arrow points to the 'CONNECT' button for the RN4871-46B1 device.

Step 2: Connecting to the Device

The second screenshot shows the 'Device Information' page for the RN4871-46B1 device. The 'CONNECT' button is highlighted by a red arrow.

Step 3: Viewing Device Information

The third screenshot shows the 'Device Information' page. The 'UNKNOWN SERVICE' section is highlighted by a red circle.

Step 4: Writing a Value

The fourth screenshot shows the 'Write value' dialog box. The 'ADD VALUE' button is highlighted by a red circle.

Test the RN4871 click Driver

```

/*****
/** Global Variables (This code in rn4871.c)
*****/

uint8_t f_pktReceived;
uint8_t f_pktParsed;
uint8_t rxPkt[64];
char txPkt[64];
uint16_t pktSize;
uint8_t cmd[32];
uint8_t bufIndx;
char pktData[8] = {'D','A','T','A','5','6','7','8'};

void sendPkt (void)
{
// Construct the pktData
txPkt[ 0 ] = '#';
txPkt[ 1 ] = '9';
strcat( txPkt, pktData );
strcat( txPkt, " *\r\n\0" );
pktSize = strlen(txPkt);
HAL_UART_Transmit(&huart1,(uint8_t *)txPkt,strlen(txPkt),0xFFFFFFFF);
}

```

```

/* Infinite loop in main.c */
/* USER CODE BEGIN WHILE */
while (1)
{
if(CharInQueue())
{
recvPkt();
}

if(f_pktParsed)
{
f_pktParsed = 0;
sendPkt();
}
}
/* USER CODE END WHILE */
/* USER CODE BEGIN 3 */
}
/* USER CODE END 3 */

```

(0x) 23-39-44-41-54-41-35-36-37-38-2A-0D-0A

#- 9- D- A- T- A- 5- 6- 7- 8- *-CR-LF

3:23

64%

Devices

DISCONNECT

BONDED

ADVERTISER

RN4871-46B1

44:B7:D0:26:46:B1

CONNECTED

NOT BONDED

CLIENT

SERVER

Device Information

UUID: 0x180A

PRIMARY SERVICE

Unknown Service

UUID: 49535343-fe7d-4ae5-8fa9-9fafd205e455

PRIMARY SERVICE

Unknown Characteristic

UUID: 49535343-1e4d-4bd9-ba61-23c647249616

Properties: INDICATE, NOTIFY, WRITE, WRITE NO RES...

Value: (0x) 23-39-44-41-54-41-35-36-37-38-2A-0D-0A

Descriptors:

Client Characteristic Configuration

UUID: 0x2902

Value: Indications enabled

Unknown Characteristic

UUID: 49535343-8841-43f4-a8d4-ecbe34729bb3

Properties: WRITE, WRITE NO RESPONSE

Value: (0x) 23-43-45-43-0D-0A

Unknown Characteristic

UUID: 49535343-4c8a-39b3-2f49-511cff073b7e

Properties: NOTIFY, WRITE

Descriptors:

Client Characteristic Configuration

UUID: 0x2902

22

Next Time...

MORE TO COME..

Thank you for attending!!!

Please consider the resources below:

- **Today's Download Package**
- **STM32C071RB Datasheet**
- **NUCLEO-C071RB Schematic**
- **RN4871 Datasheet**





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Thank You

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