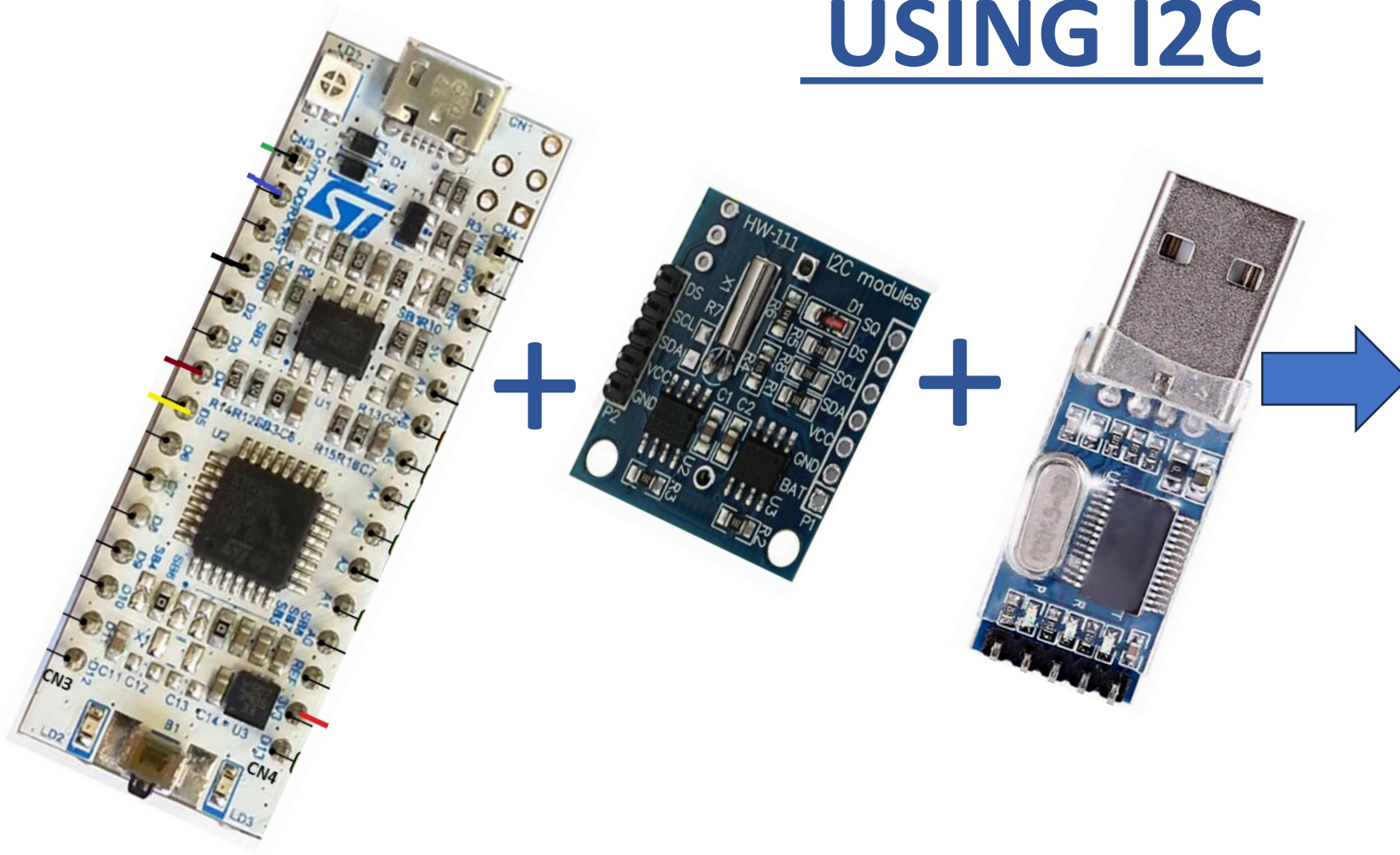
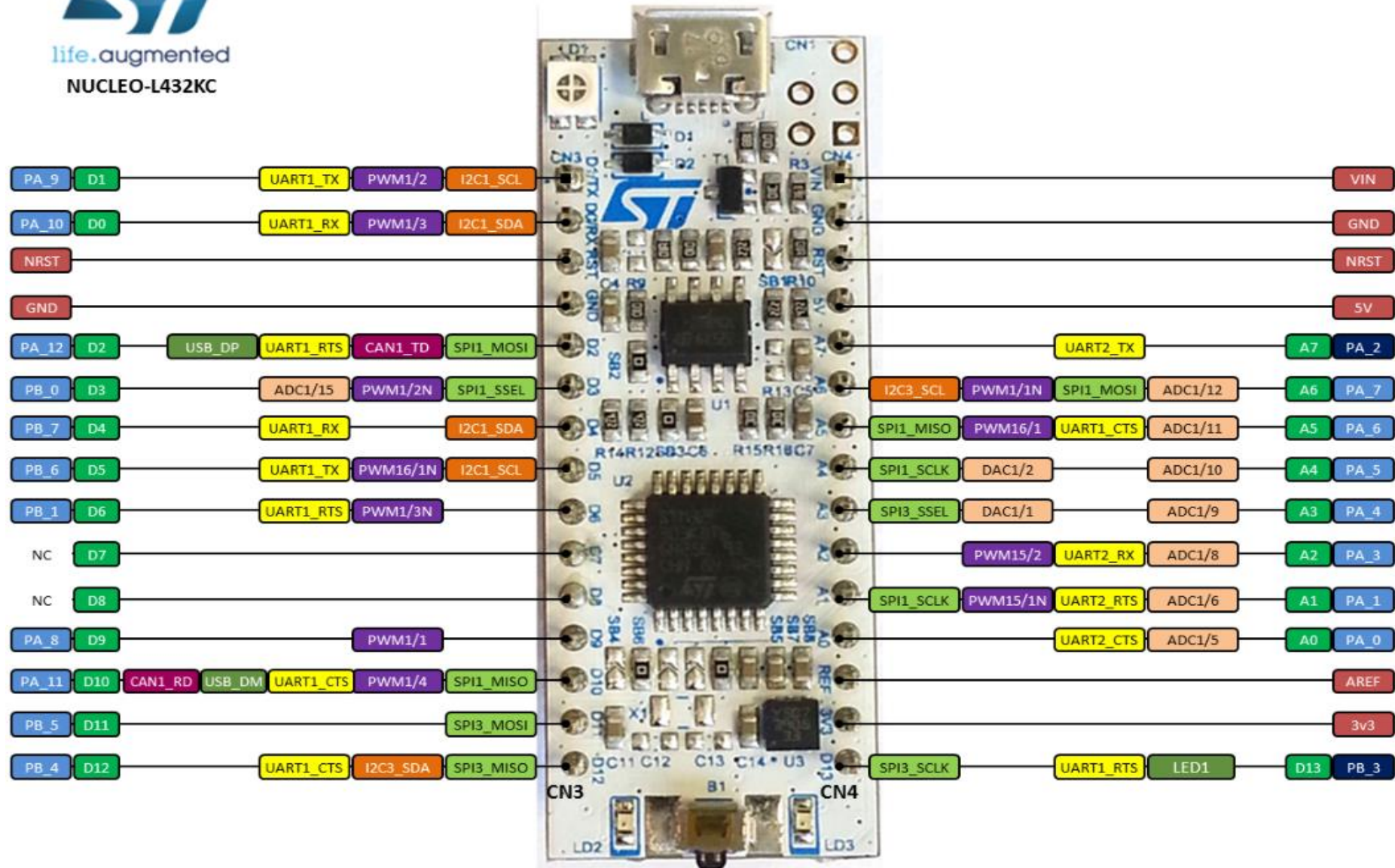


STM32-EXTERNAL RTC INTERFACE USING I2C

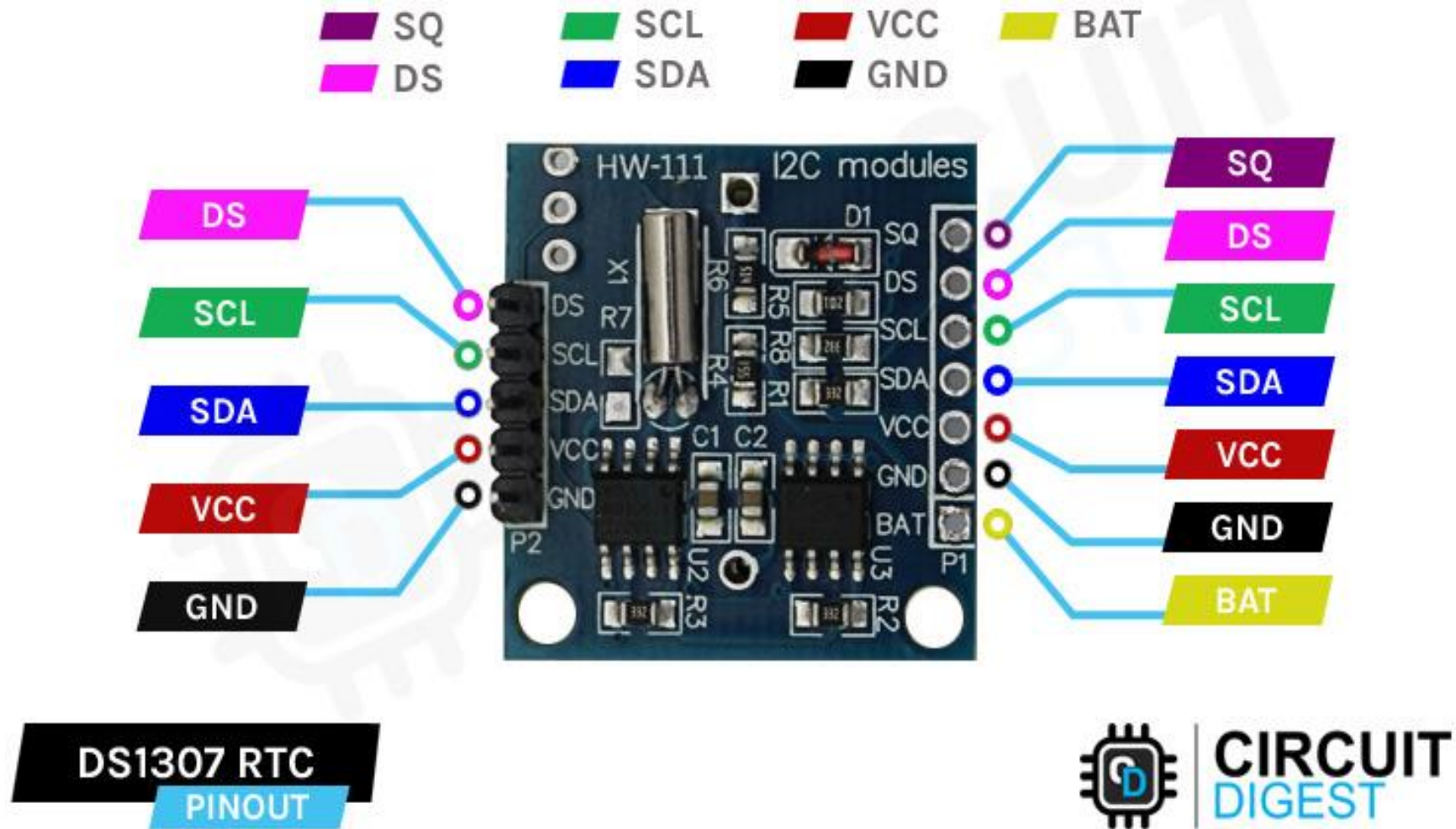


```
Time: 18:01:32, Date: 14/09/23<CR><LF>  
Time: 18:01:33, Date: 14/09/23<CR><LF>  
Time: 18:01:34, Date: 14/09/23<CR><LF>  
Time: 18:01:35, Date: 14/09/23<CR><LF>  
Time: 18:01:36, Date: 14/09/23<CR><LF>  
Time: 18:01:37, Date: 14/09/23<CR><LF>  
Time: 18:01:38, Date: 14/09/23<CR><LF>  
Time: 18:01:39, Date: 14/09/23<CR><LF>
```

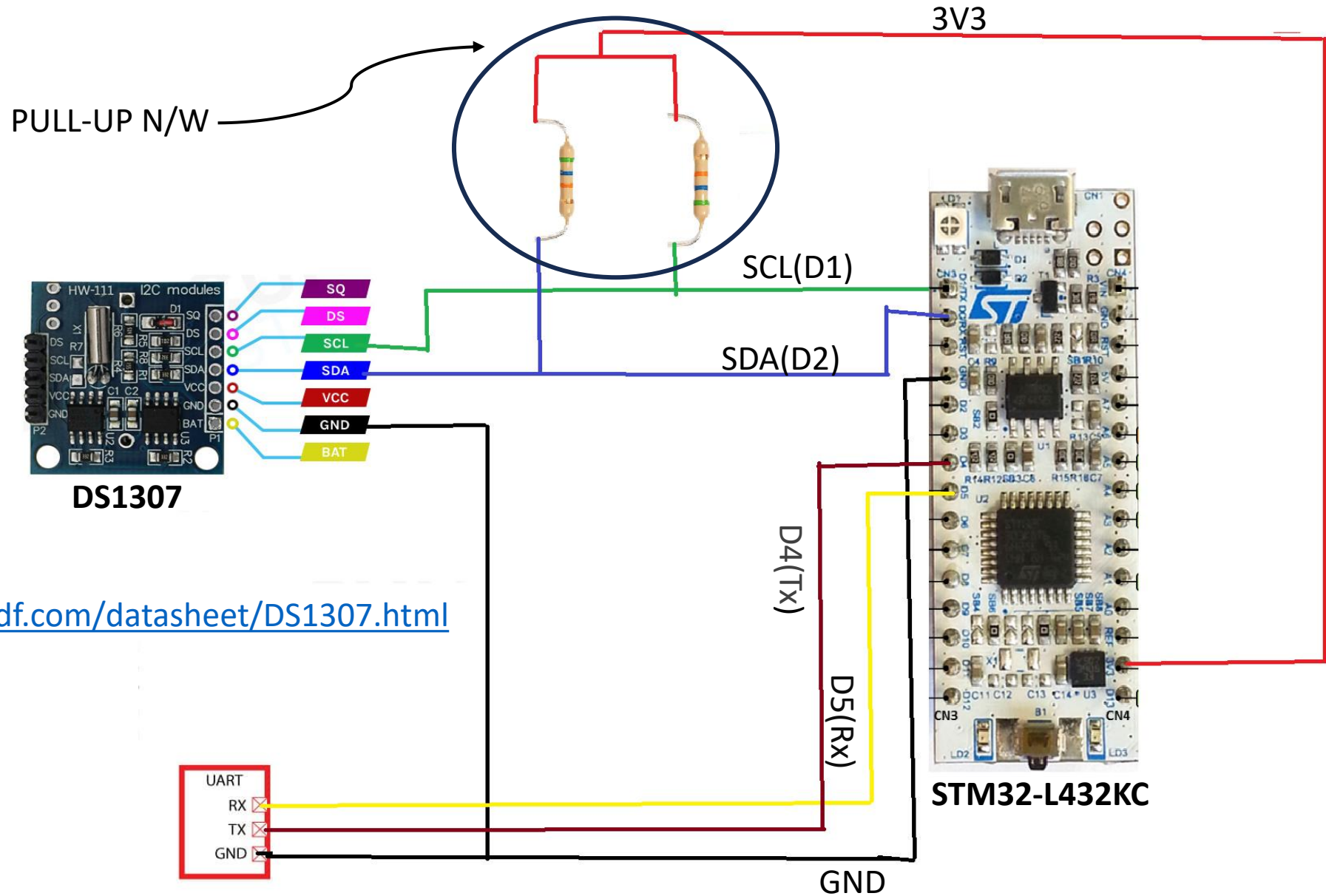
STM32-L432KC PIN DIAGRAM.



DS1307-RTC PIN DIAGRAM



CIRCUIT DIAGRAM.



DS1307-

<https://datasheetspdf.com/datasheet/DS1307.html>

Pinout and Configuration

RTC_N.ioc ×main.cstm32l4xx_hal_i2c.c

RTC_N.ioc - Pinout & Configuration

Pinout & Configuration

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Configuration

Group By Peripherals

I2C ✓RCC ✓USART ✓

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Pin	Signal	GPIO ou	GPIO m	GPIO P	Maximu	Fast Mo	User La	Modified
PA9	I2C1_S...	n/a	Alternat...	Pull-up	Very High	n/a		<input checked="" type="checkbox"/>
PA10	I2C1_S...	n/a	Alternat...	Pull-up	Very High	n/a		<input checked="" type="checkbox"/>

PA10 Configuration :

GPIO mode

Alternate Function Open Drain

GPIO Pull-up/Pull-down

Pull-up

Maximum output speed

Very High

User Label

Pinout view

System view

USART1_RX

USART1_TX

RCC_OSC32_IN

RCC_OSC32_OUT

I2C1_SDA

I2C1_SCL

STM32L432KCUx

UFQFPN32

Code

```
59 /* USER CODE END PFP */
60
61 /* Private user code -----*/
62 /* USER CODE BEGIN 0 */
63 #define DS1307_ADDRESS 0xD0
64
65 /* USER CODE END 0 */
```

Slave Address of DS1307: (Refer Datasheet for more information)

Address- >**1101000** = 0x68

* @param DevAddress Target device address: The device 7 bits address value
* in datasheet must be shifted to the left before calling the interface

0x68<<1 = 0xD0

```

93  /* Initialize all configured peripherals */
94  MX_GPIO_Init();
95  MX_I2C1_Init();
96  MX_USART1_UART_Init();
97  /* USER CODE BEGIN 2 */
98
99  uint8_t rtcData[8];
100  rtcData[0] = 0x00; // Address of RTC seconds register
101  rtcData[1] = 0x00; // Seconds
102  rtcData[2] = 0x01; // Minutes
103  rtcData[3] = 0x18; // Hours (hours in 24-hour format)-Refer Datasheet to change to 12hr
104  rtcData[4] = 0x04; // Day of the week (Thursday)- 1->Monday, 2->Tuesday,.....
105  rtcData[5] = 0x14; // Date (14th day of the month)
106  rtcData[6] = 0x09; // Month (September)
107  rtcData[7] = 0x23; // Year (2023)
108
109  if (HAL_I2C_Master_Transmit(&hi2c1, DS1307_ADDRESS, rtcData, sizeof(rtcData), HAL_MAX_DELAY) != HAL_OK) {
110      Error_Handler();
111  }
112
113  char uartBuffer[50]="0";
114  /* USER CODE END 2 */

```

Table 2. Timekeeper Registers

ADDRESS	BIT 7	BIT 6	BIT 5	BIT 4	BIT 3	BIT 2	BIT 1	BIT 0	FUNCTION	RANGE
00h	CH	10 Seconds			Seconds				Seconds	00–59
01h	0	10 Minutes			Minutes				Minutes	00–59
02h	0	12	10 Hour	10 Hour	Hours				Hours	1–12 +AM/PM 00–23
		24	PM/ AM							
03h	0	0	0	0	0	DAY			Day	01–07
04h	0	0	10 Date		Date				Date	01–31
05h	0	0	0	10 Month	Month				Month	01–12
06h	10 Year				Year				Year	00–99
07h	OUT	0	0	SQWE	0	0	RS1	RS0	Control	—
08h–3Fh									RAM 56 x 8	00h–FFh

0 = Always reads back as 0.

Reference:

<https://youtu.be/rS47nOcvMeU?si=hDmaRXdj-sopHRhY>

```

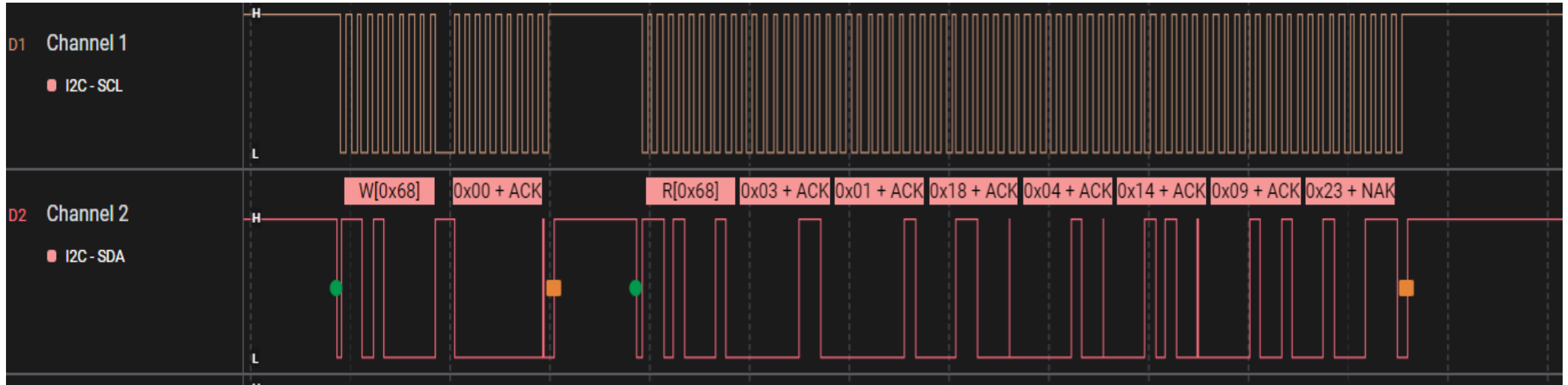
117  /* USER CODE BEGIN WHILE */
118  while (1)
119  {
120
121      rtcData[0] = 0x00;
122
123
124      if (HAL_I2C_Master_Transmit(&hi2c1, DS1307_ADDRESS, rtcData, 1, HAL_MAX_DELAY) != HAL_OK) {
125          Error_Handler();
126      }
127
128
129      if (HAL_I2C_Master_Receive(&hi2c1, DS1307_ADDRESS, rtcData, sizeof(rtcData) - 1, HAL_MAX_DELAY) != HAL_OK)
130          Error_Handler();
131      }
132
133
134      snprintf(uartBuffer, sizeof(uartBuffer), "Time: %02X:%02X:%02X, Date: %02X/%02X/%02X\r\n",
135              rtcData[2], rtcData[1], rtcData[0], rtcData[4], rtcData[5], rtcData[6]);
136      HAL_UART_Transmit(&huart1, (uint8_t *)uartBuffer, strlen(uartBuffer), HAL_MAX_DELAY);
137
138      HAL_Delay(1000);
139  /* USER CODE END WHILE */

```


UART Output:

```
Time: 18:01:27, Date: 14/09/23<CR><LF>
Time: 18:01:28, Date: 14/09/23<CR><LF>
Time: 18:01:29, Date: 14/09/2F<CR><LF>
Time: 18:01:30, Date: 14/09/23<CR><LF>
Time: 18:01:31, Date: 17/FF/FF<CR><LF>
Time: 18:01:32, Date: 14/09/23<CR><LF>
Time: 18:01:33, Date: 14/09/23<CR><LF>
Time: 18:01:34, Date: 14/09/23<CR><LF>
Time: 18:01:35, Date: 14/09/23<CR><LF>
Time: 18:01:36, Date: 14/09/23<CR><LF>
Time: 18:01:37, Date: 14/09/23<CR><LF>
Time: 18:01:38, Date: 14/09/23<CR><LF>
Time: 18:01:39, Date: 14/09/23<CR><LF>
```

Logic Analyzer:



Verifying Output in Logic Analyzer:

■	start	9.889 165 000 s	1000 ns						
■	address	9.889 180 000 s	131 μs	true	0x68	true			
■	data	9.889 320 000 s	132 μs	true			0x00	Seconds	
■	data	9.889 461 000 s	132 μs	true			0x01	Minutes	
■	data	9.889 602 000 s	132 μs	true			0x18	Hours(24hr)	
■	data	9.889 743 000 s	134 μs	true			0x04	Day(Thursday)	
■	data	9.889 887 000 s	133 μs	true			0x14	Date	
■	data	9.890 030 000 s	134 μs	true			0x09	Month	
■	data	9.890 173 000 s	132 μs	false			0x23	Year	
■	stop	9.890 322 000 s	1 μs						

