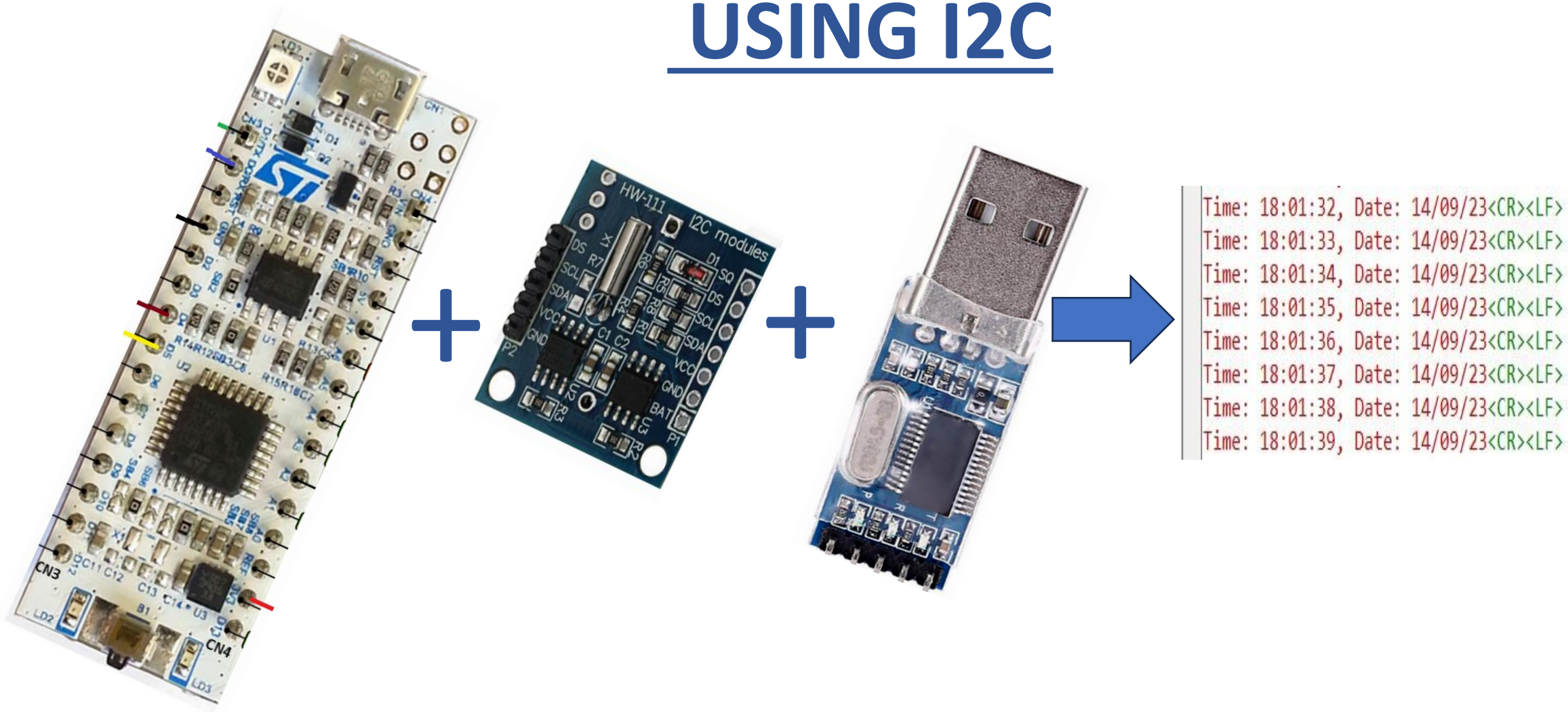
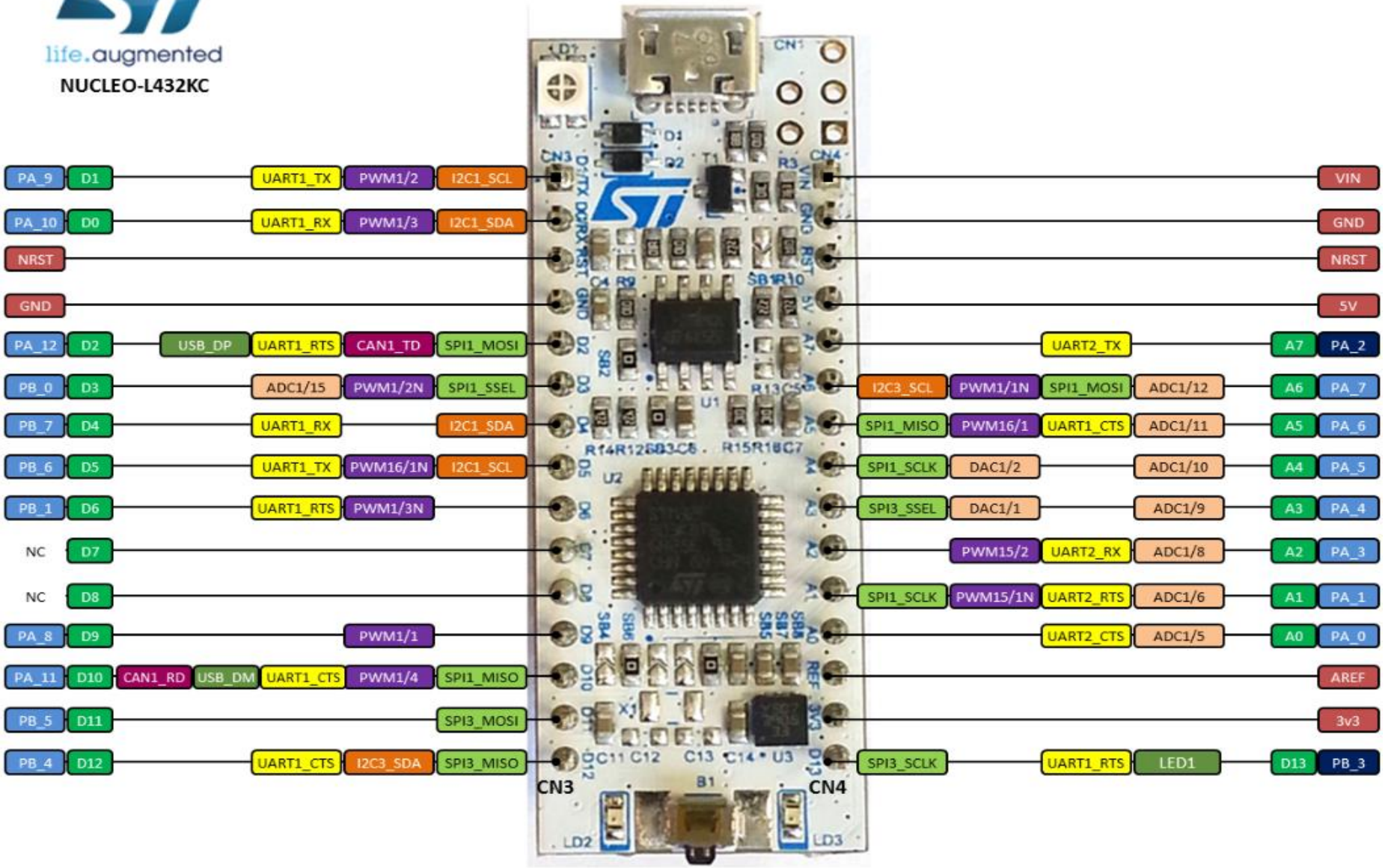
STM32-EXTERNAL RTC INTERFACE USING I2C



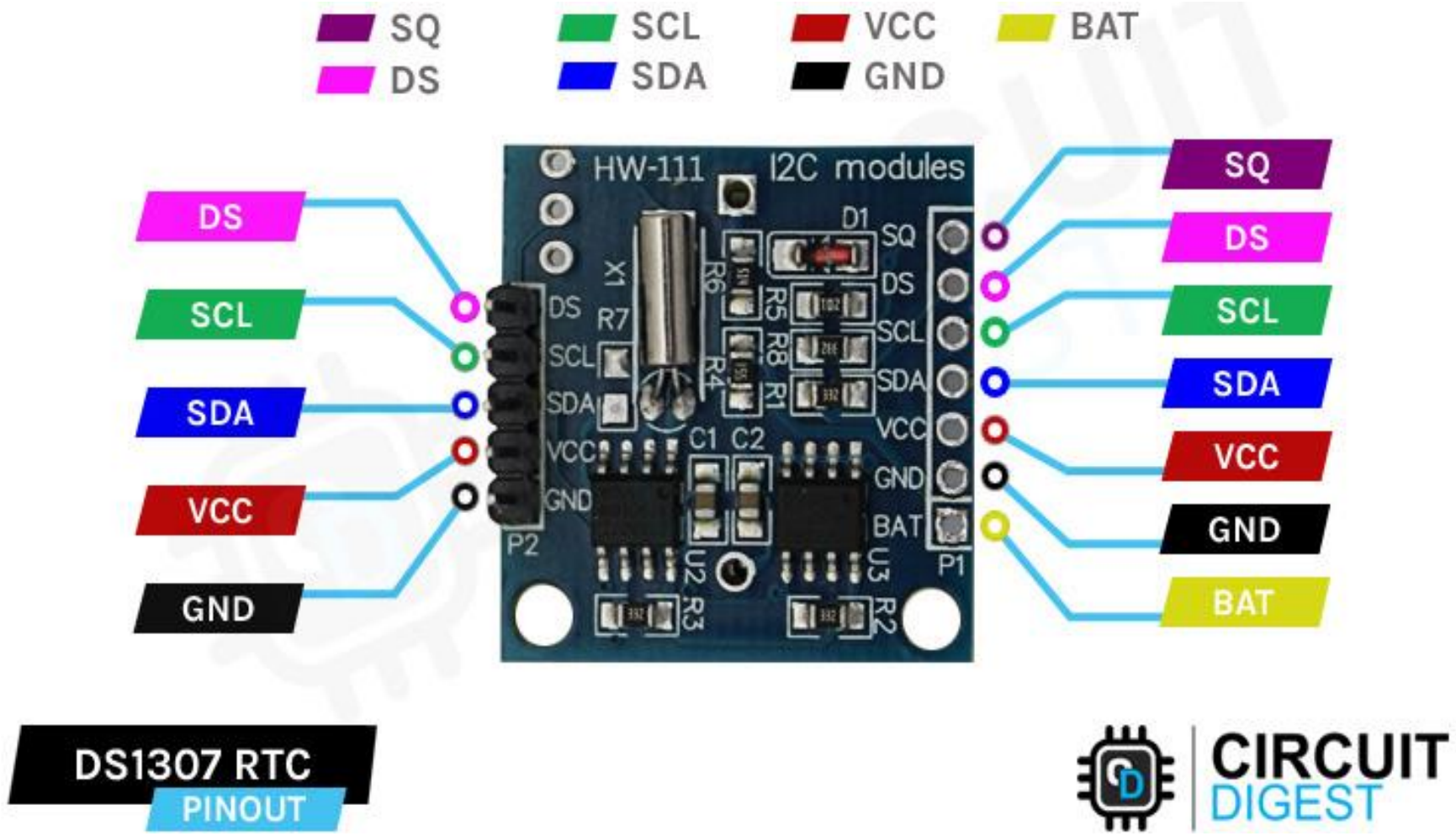
STM32-L432KC PIN DIAGRAM.

life.augmented

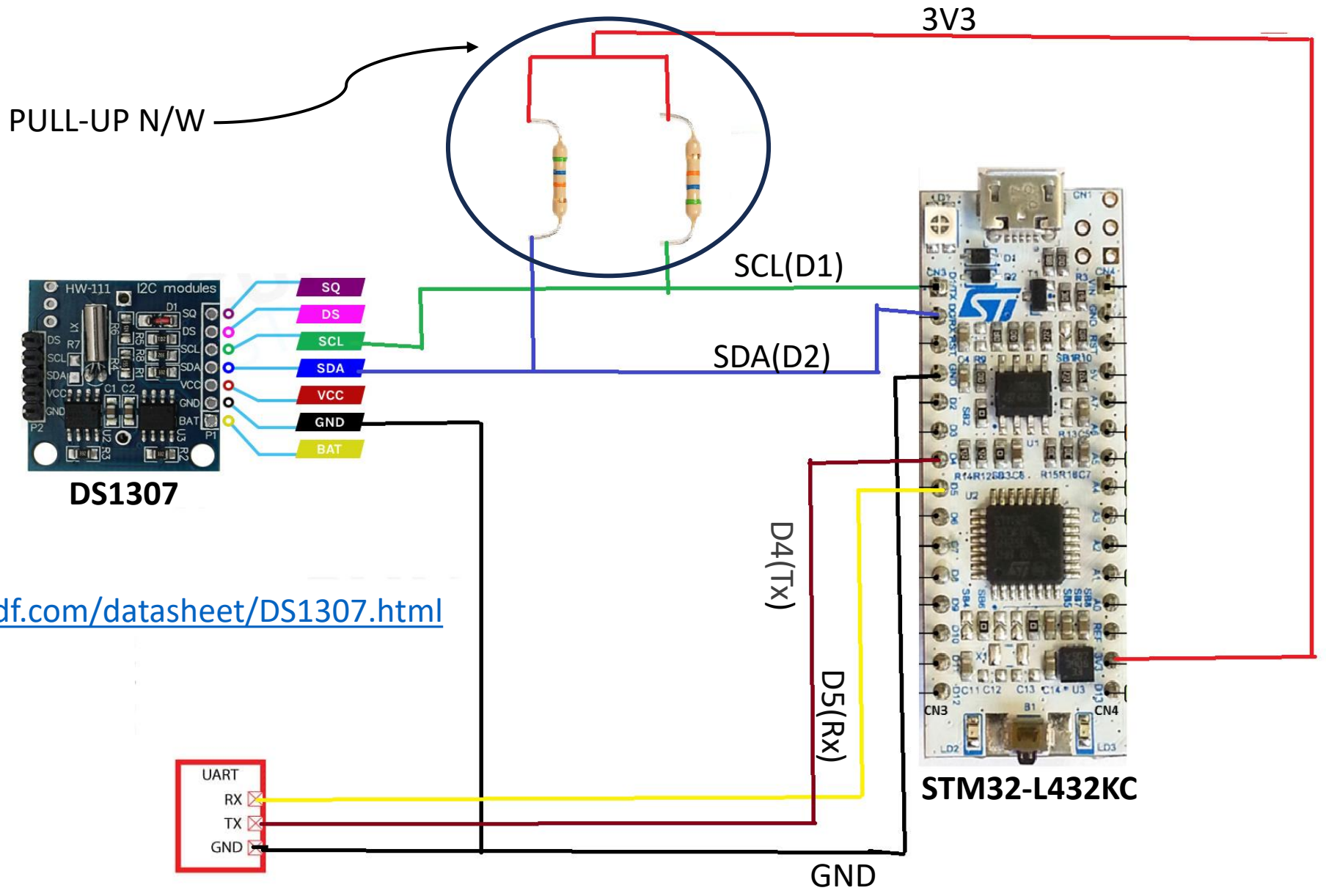
NUCLEO-L432KC



DS1307-RTC PIN DIAGRAM

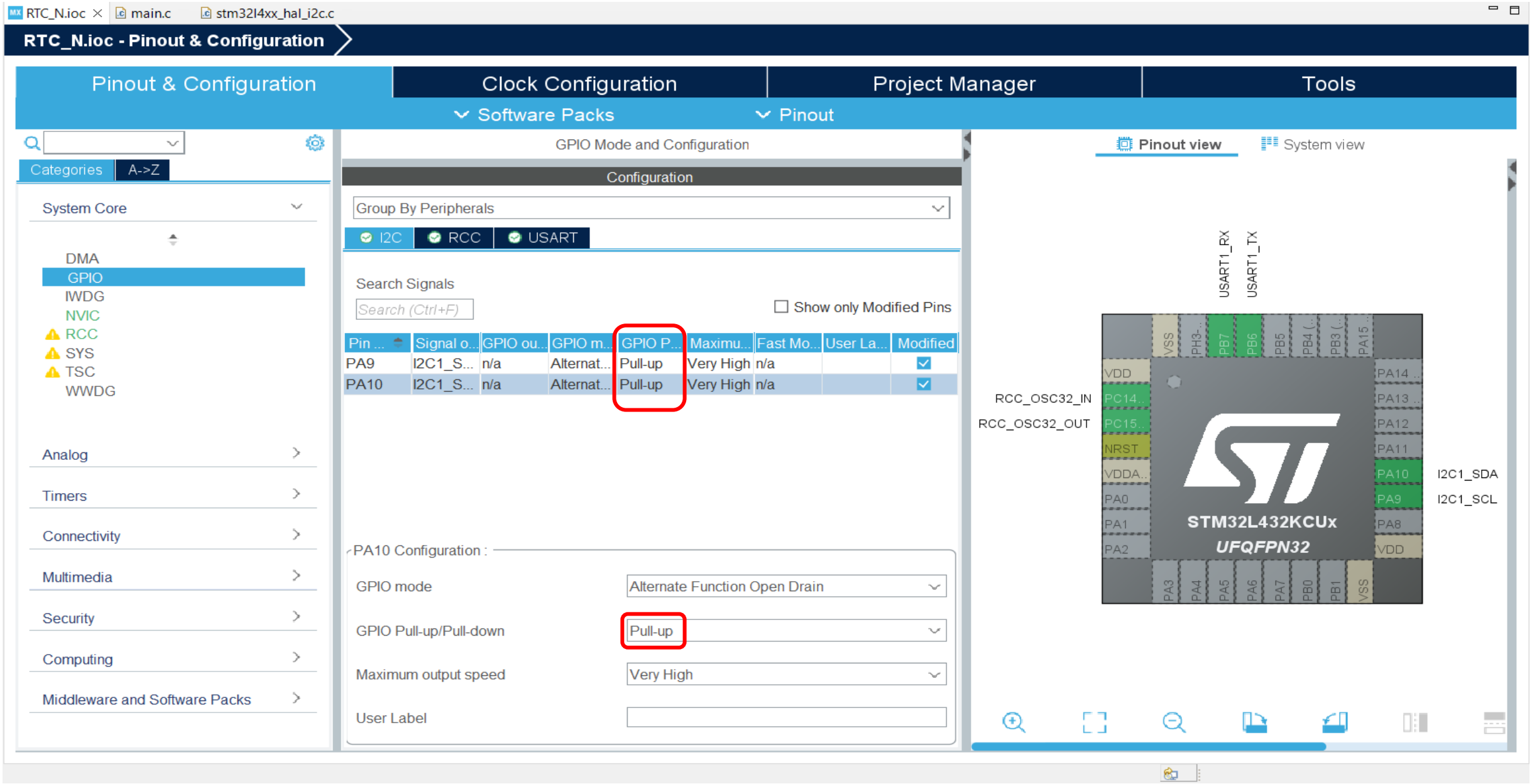


CIRCUIT DIAGRAM.



DS1307-
https://datasheetspdf.com/datasheet/DS1307.html

Pinout and Configuration



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:

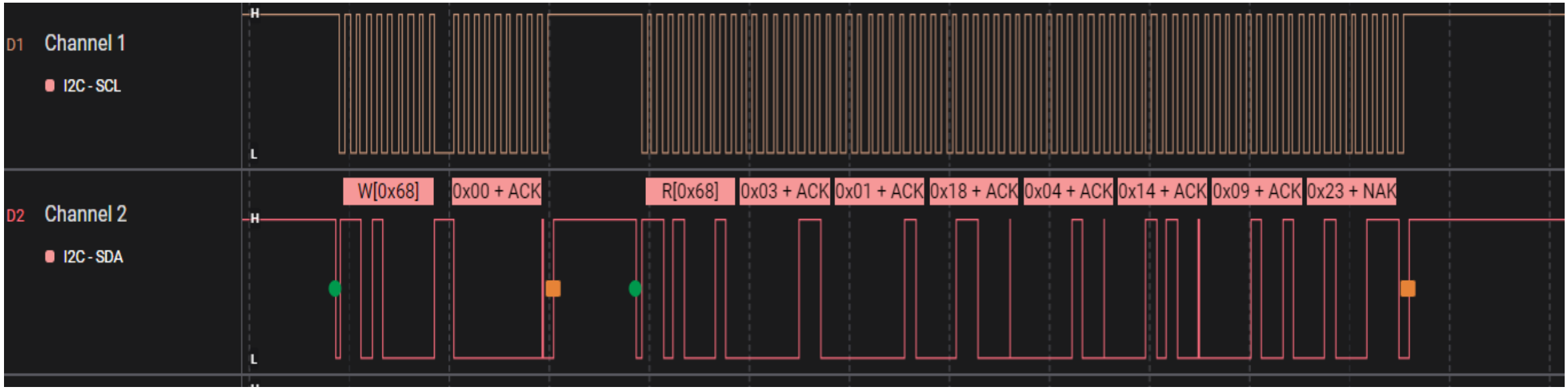
https://youtu.be/rS47nOcvMeU?si=hDmaRXdj-sopHRhY

```
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