Digital Temperature Sensor Module for Temperature Application

MCU

STM32F407 series MCU is selected for this module. It is easy to find resources and it's IDE is free. So making it easy to develop. At the same time STM32F407 is 32 bit MCU and it can operate 168 MHz. It is suitable for projects involving communication protocols. And It has very user-friendly "HAL" Library whic it includes low level peripheral driver. Also it has low current consumption in low power mode. MCU Datasheet Link : https://www.st.com/resource/en/datasheet/dm00037051.pdf

SENSOR

TI TMP116 Digital Temperature sensore selected for this module. Benefits of this sensor are listed below:

- High accurracy (+-0.2 Celcius without calibration)
- Low Quiescent Current (3,5 uA at 1 Hz conversion cycle, 250 nA shutdown current)
- Low Supply Voltage (1.9 V -5.5 V)
- EEPROM Option (not used in this project)
- Low Price (about 1.2 dolars)
- Resolution: 16 bits at 0.0078°C

As we see, this sensor can make measurement with high accuracy and resolution. In this way, this module will keep the measurement error minimum. It consumes very small amount of power in low power mode.

Sensor Datasheet : https://www.ti.com/lit/ds/symlink/tmp116.pdf

SOFTWARE

The software developed on STMCubeIDE. The main idea of the program is, put the MCU in sleep mode. Wake up the MCU with timer interrupt (about 1 second) and get the result of measurement. Send it with Uart and put MCU sleep mode and put sensor shutdown mode.

I used this document to get an idea about Low Power Temperature applications

Link : Low-Power Design Techniques for Temperature-Sensing