Module 3: Sensor Driver – AHT20 Temperature & Humidity

Learning Objectives

- Understand AHT20 I2C protocol
- Send measurement commands
- Read and convert raw data
- Create and run AHT20 project

3.1 AHT20 Introduction

The AHT20 (also known as Aosong/Amsen AHT20) is a digital temperature and humidity sensor featuring high accuracy, low power consumption, and digital output. It integrates temperature/humidity sensing elements, an ADC conversion unit, and a signal processing unit internally, outputting data via an I2C interface, thereby eliminating the need for complex analog signal processing. Due to its small size, high consistency, and ease of use, it is widely utilized in industrial control, consumer appliances, environmental monitoring, IoT, and other fields.

- Digital temperature & humidity sensor
- I2C interface
- Fixed 7-bit address: **0x38**
- Write: 0x70 | Read: 0x71

3.2 Commands

Fixed I2C Address of AHT20: 0x38 (7-bit address)

- Write Operation: 0x70
- Read Operation: 0x71

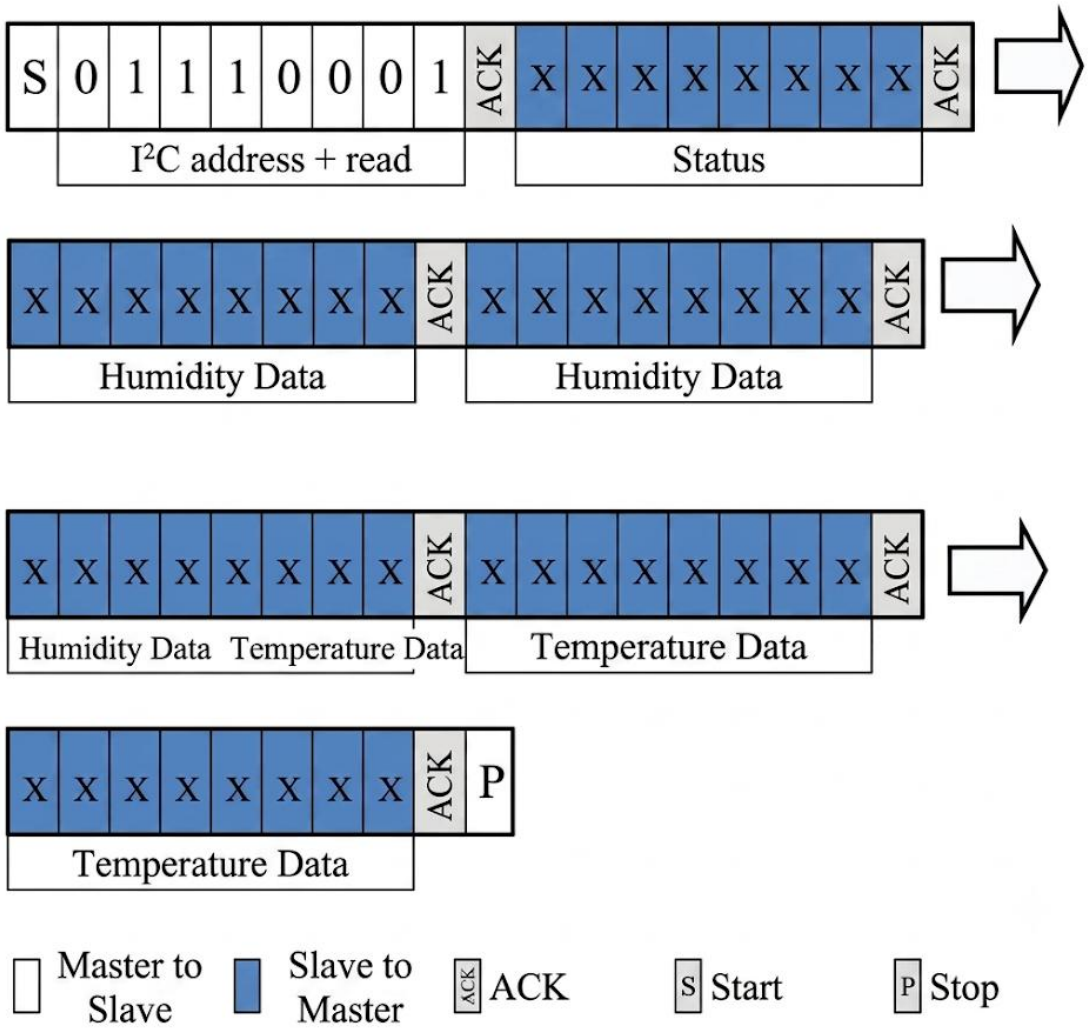
Command	Code
Initialization	1110 0001 (0xE1)
Soft Reset	1011 1010 (0xBA)
Trigger Measurement	1010 1100 (0xAC)

3.3 Status Bits

Bit	Significance	Description
Bit [7]	Busy indication	1--Device is busy, in measuring state 0--Device is idle, in sleep state
Bit [6:5]	Mode Status	00 Currently in NOR mode 01 Currently in CYC mode 1x Currently in CMD mode
Bit [4]	Reserved	Reserved
Bit [3]	Calibration Enable Bit	1—Calibrated 0--Uncalibrated
Bit [2:0]	Reserved	Reserved

3.4 Trigger Measurement Data

3.5 Read Temperature and Humidity Data



Note: The sensor requires time to collect data. After the master issues the measurement command (0xAC), it should delay for more than 75 milliseconds before reading the converted data and checking whether the returned status bit is normal. If status bit [Bit 7] is 0, it means data can be read normally; if it is 1, the sensor is busy, and the master needs to wait for data processing to complete.

3.6. Temperature and Humidity Data Conversion

3.7. Relative Humidity Conversion

The relative humidity RH can be calculated from the relative humidity signal S_{RH} output by the SDA line using the following formula (result expressed in %RH):

$$\boldsymbol{RH}[\%] = \left(\frac{\boldsymbol{S_{RH}}}{\boldsymbol{2^{20}}}\right) \times \boldsymbol{100}\%$$

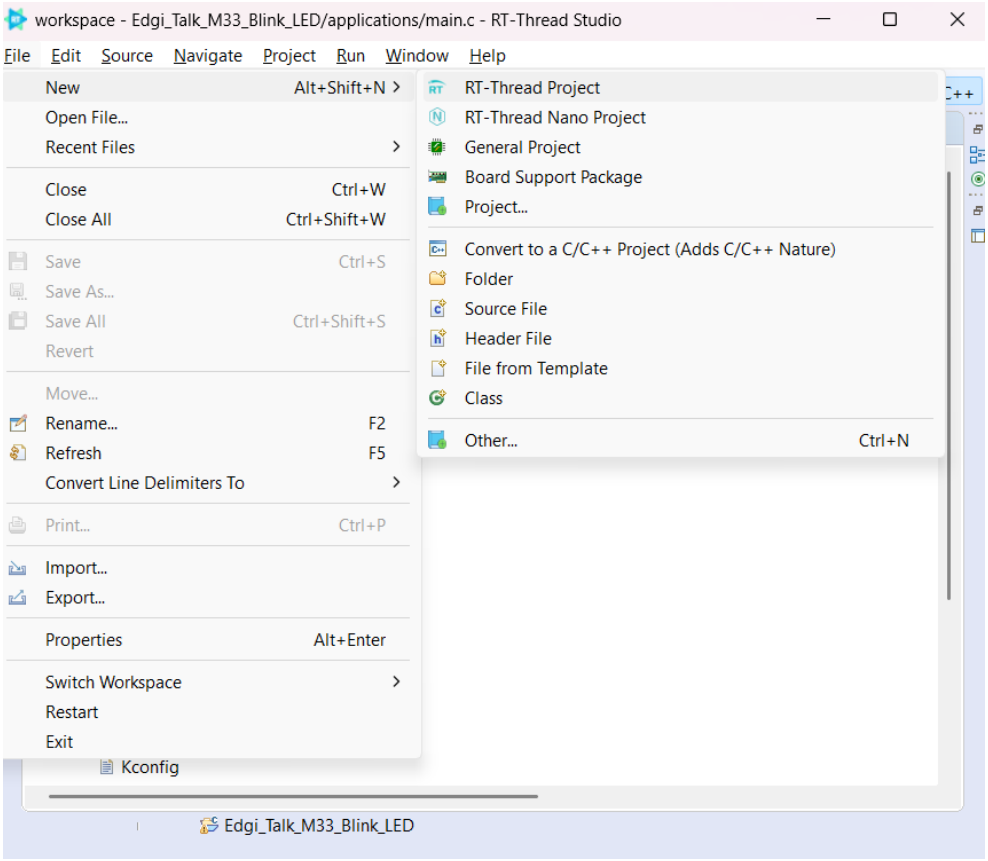
3.8. Temperature Conversion

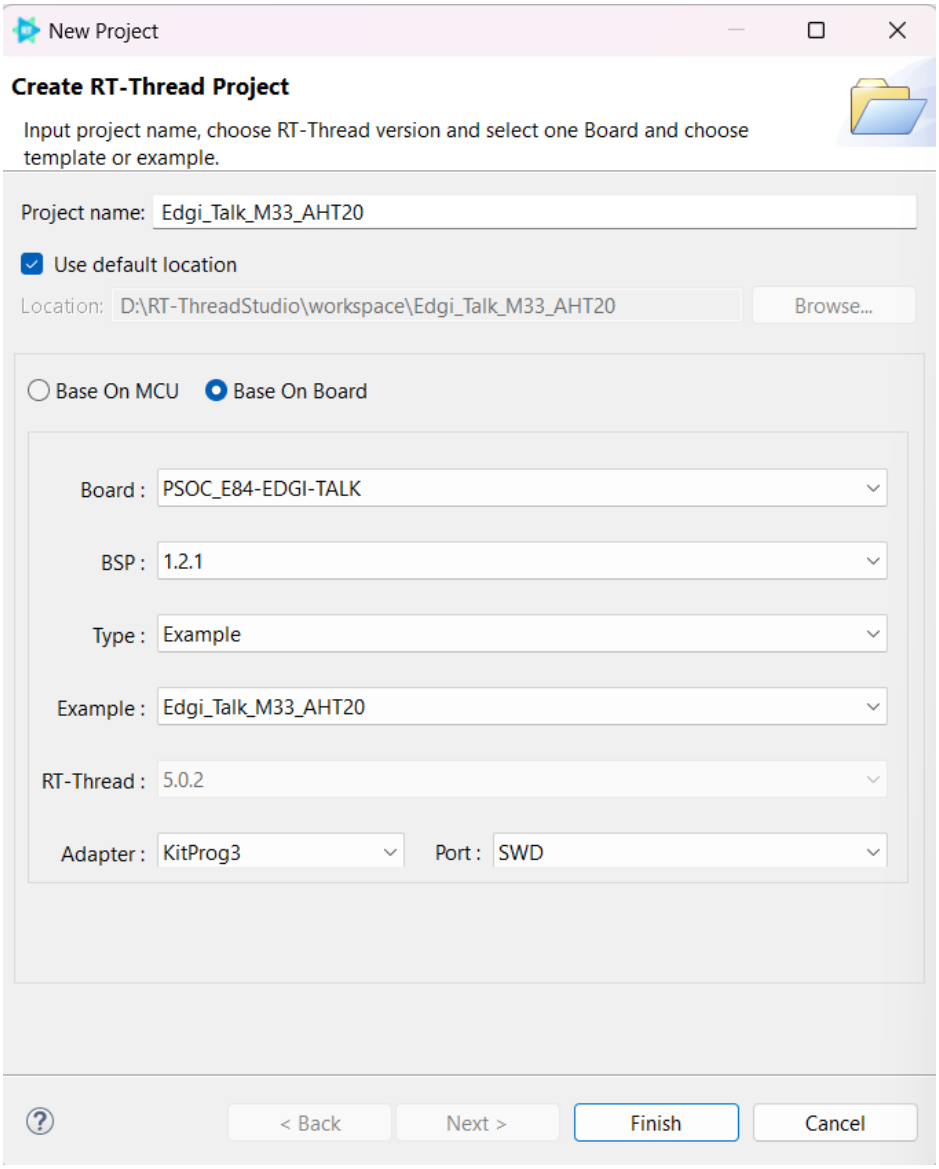
The temperature T can be calculated by substituting the temperature output signal S_T into the following formula (result expressed in °C):

$$\boldsymbol{T(\circ \mathbf{C}) = \left(\frac{S_T}{2^{20}}\right) \times 200 - 50}$$

3.9 Creating AHT20 Project

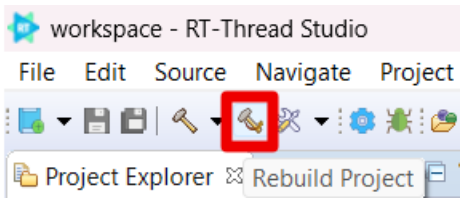
- Project Name: Edgi_Talk_M33_AHT20_1
- Board: PSOC_E84-EDGI-TALK | BSP: 1.2.1
- Example: AHT20 example




New Project
Create RT-Thread Project
Input project name, choose RT-Thread version and select one Board and choose template or example.
Project name: Edgi_Talk_M33_AHT20
Use default location
Location: D:\RT-ThreadStudio\workspace\Edgi_Talk_M33_AHT20
Browse...
Base On MCU
Base On Board
Board : PSOC_E84-EDGI-TALK
BSP : 1.2.1
Type : Example
Example : Edgi_Talk_M33_AHT20
RT-Thread : 5.0.2
Adapter : KitProg3
Port : SWD
< Back
Next >
Finish
Cancel

3.10 Build & Flash

- Compile with Hammer icon



- Flash with Download icon

3.11 Expected Result

Press the RST button on RT-Thread Board

Serial terminal prints temperature & humidity every 1 second: