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Final Project

Microcontroller Comparison

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**Microcontroller Comparison Review:**

**Ti CC3220S vs. MicrochipATSAMW25 and the Arduino Nano RP2040 Connect vs. Ti CC3220S**

**Ti CC3220S vs MicrochipATSAMW25:**

The ATSAMW25 microcontroller by the company Microchip, has many of the same features as the TI CC220S microcontroller that was used for this project. The ATSAMW25, has SPI, UART, and two I2C communication interfaces. This microcontroller also has wireless connectivity as well as a multitude of different sensors, giving the company the ability to expand the functionality of the thermostat in the future. The core of the ATSAMW25 uses a 128KB instruction/boot ROM along with a 128KB instruction RAM and a 64KB data RAM. Altogether, the ATSAMW25 has 256KB embedded Flash and 32KB SRAM. This CC3220S has 1MB of user-dedicated flash memory and 256KB of RAM. The ATSAMW25 also can connect to WIFI like the CC3220S and has a similar WIFI speed ranging between 56 Mb/s - 72 Mb/s. One other main difference between the Ti CC3220S and the Microchip ATSAMW25, is in their processors and processor speeds. The Ti CC3220S has an ARM® Cortex® -M4 MCU processor with clock speeds of 80 Mhz. This is faster than the Microchip ATSAMW25’s ARM Cortex-M0+ based MCU processor which only has speeds up to 48MHz. The last major difference between these two microcontrollers is their size. The Microchip ATSAMW25 is smaller than the Ti CC3220S and therefore can fit into more compact packaging.

Out of the two of these microcontrollers, based purely on their specifications, I would pick the CC3220S. This is because the CC3220S, can handle larger and more complex programs than the Microchip ATSAMW25 can. This is since the CC3220S has a better and faster processor as well as has more onboard memory. If the company would like to consider a smaller form factor for their thermostat, I do believe the Microchip ATSAMW would be a great pick.

**Arduino Nano RP2040 Connect VS Ti CC3220S**

The Arduino Nano RP2040 Connect, is a great microcontroller, that is not only cheaper than the Ti CC3220s but is faster and has a larger SRAM capacity. The Arduino Nano RP2040 Connect, has a dual-core Arm Cortex M0+ like the Microchip ATSAMW25 but has much faster speeds, running at 133MHz. The Arduino Nano RP2040 Connect has 264KB of SRAM, and 16MB of flash memory is off chip which provides extra storage. This is much more than the CC3220S, as it only had 1MB of user-dedicated flash memory. The Arduino microcontroller also has WIFI and Bluetooth connectivity which none of the other microcontroller have. The Arduino’s WIFI speeds range between 20-40 Mb/s depending on the channel used. This microcontroller also supports the SPI, UART, I2C communication interfaces like the CC3220S and has a temperature sensor as well. The other main difference between the Arduino Nano RP2040 and the Ti CC3220S is their size. The Arduino Nano RP2040 is smaller than the Ti CC3220S allowing for smaller form factors.

Out of the three microcontrollers discussed, the Arduino Nano RP2040, is what I believe to be the better microcontrollers for the new thermostats. The Arduino Nano RP2040 does not only have a faster processor and more onboard memory than the Ti CC3220S and the Microchip ATSAMW25, but it also has Bluetooth connectivity. This extra wireless connectivity will allow our thermostat to connect to other smart devices in the home which is a feature our customers will look forward to using. The Arduino Nano RP2040 will also be cheaper to manufacture thermostats with as it costs less than the other two devices. The only downside to this device is that its WIFI speeds are slightly slower than the Ti CC3220S. However, this shortcoming is quickly overcome by the Arduino’s extra memory, faster processor, and extra capabilities.

References

*Arduino Nano RP2040 Connect with headers*. (n.d.). Arduino. Retrieved June 28, 2021, from <https://store.arduino.cc/nano-rp2040-connect-with-headers>

*ATSAMW25-MR210P*. (n.d.). Microchip. Retrieved June 28, 2021, from <https://ww1.microchip.com/downloads/en/DeviceDoc/Atmel-42618-SmartConnect-ATSAMW25-MR210PB_Datasheet.pdf>

*CC3220 SimpleLinkTM Wi-Fi® LaunchPadTM Development Kit Hardware*. (2020). Texas Instruments. <https://www.ti.com/lit/ug/swru463c/swru463c.pdf?ts=1624765369658>