**Word Count: 799**

Video, Part 1: In-depth insights into the hardware features of the Raspberry Pi 4 Model B

In this video, we will have a more in-depth look into the CPU, GPU, RAM, the Status LEDs, and the GPIO Headers of the Raspberry Pi 4 B.

In the last video, we only did a brief overview of the different components on the Raspberry Pi 4 Board. In this video, we will dive deep into its features.

We will first start with the brain of the Raspberry Pi 4 Model B. It is a 64 bit Quad Core Broadcom BCM2711 SoC that runs at 1.5 GHz. On paper, it's just 100 MHz faster than the Raspberry Pi 3 Model B+'s Broadcom BCM2837 chip, but on real-life use, it's a 2 to 3 times faster than the older generation. This is because the Pi 4 uses ARM Cortex-A72 cores, rather than the older Cortex-A53. The reason why A72 cores are faster at the same speed is due to its architecture that prioritizes performance over efficiency. This is one of the reasons that Pi 4 can get a bit toasty if ran without a heatsink and a fan for a prolonged time. The SoC also has a new model Graphics Processing Unit named Broadcom VideoCore VI, which runs at 500 MHz, and supports OpenGL ES 3. The new GPU is two generations ahead of any GPU's used prior to in the Pi lineup. The GPU also has a hardware decoder for 4K and 1080p video at 60 frames per second. If you want to know more about the CPU and the GPU, please check out the links in the resources section.

Next comes the memory. It comes in 3 variants. You choose between 1 GB, 2GB or 4 GB RAM models, based on the applications. Amazingly, all the RAM options are LPDDR4 and running at 2400 MHz. These are commonly referred to as Synchronous DRAM or SDRAM. These are the latest and greatest RAM chips that are commonly used in mobile devices like smartphones and laptops. In addition to the increased bandwidth, having more memory is a huge deal, particularly for web surfing on the Pi 4.

No matter how fast your processor, RAM, and GPU are, if your storage is slow, everyday tasks like opening apps and files will be laggy. Like all Raspberry Pis, the 4 B's primary storage device is its microSD card reader, which is convenient but a bit constrained. According to the Pi Foundation, Pi 4 B has a top transfer rate of 50 MBps, which is double the speed of the reader on the Pi 3 B+.

Next, let's check out the red and green LED's marked PWR and ACT, respectively. When you power your Raspberry Pi, the red LED will light up continuously. If there is a problem with the power received, the red LED will start blinking. The Green LED indicates SD card activity. It will flash when read or write operation is in progress. Additionally, the Green LED will also flash in specific patterns, to indicate early boot problems. The following table shows the different Green LED Flash patterns and their meaning.

The real star of the show on any Raspberry Pi is its set of 40 General Purpose Input / Output pins. The GPIO pins are integrated into the circuit board of the computer. Their behavior can be controlled by the user to allow them to read data from sensors and control components like LEDs, motors, and displays. In the labeled diagram shown here, you can see that there are different types of GPIO pins that serve different purposes. The diagram shows two pin numbers attached to every GPIO pin. It has a board number which is based on the physical location of the pin and a Broadcom SoC pin numbering, which uses the pin numbering of the pin directly connected from the SoC itself. When you start tinkering with the GPIO, you should only follow one of the two conventions. In the diagram, we can see power pins like 5V, 3v3, and ground. We can also see several GPIO pins. You can also see several SPI, I2C, and UART pins. In addition to the standard peripheral options found on the old Pis, extra I2C, UART, and SPI peripherals have been added to the BCM2711 chip and are available as further mux options on the Pi4. This gives users much more flexibility when attaching add-on hardware as compared to older models. You can check out the GPIO Functions table provided in the resources section to know more.

Summary

In this video, we have covered the following topics

* The CPU & GPU
* The RAM
* The function of the Status LEDs
* GPIO Headers

In the next video, we will have a more in-depth look into other hardware features of the Raspberry Pi 4 Model B, like Ports, Connectors, Networking Chip & Controller Chip.