

## More Power For Raspberry Pi USB Ports

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Since the Raspberry Pi 2 was released, everyone building RetroPi emulators has been graced with four USB ports. For those of us doing useful stuff with the Pi, those ports are a little anemic: you can't plug in a webcam and a WiFi module at the same time without suffering CPU brownouts. The maximum current all USB peripherals can draw from the USB port is 600mA. [By changing a value in the /boot/config.txt file](#), this current limit can be increased to 1.2A for all four ports.



The yellow line traces the signal from the GPIO to the USB power switch.

Because the USB current limit is set in software, there must be a few bits of hardware that do the actual work. Tucked away below the right hand of the GPIO header is the hardware that does exactly that. It's an [AP2253 current-limited power switch](#) (PDF), and the current is adjustable by tying a resistor to pin 5 on the chip.

Pin 5 on the AP2253 is connected to two resistors. One resistor goes directly to a ground plane, while the other is switched through a FET. The gate of this FET goes to another resistor, and when a GPIO pin is high, these resistors are wired in parallel. This means the resistance is halved when the GPIO pin is high, doubling the current limiting circuit in the AP2253.

This setup provides a relatively easy mod to increase the current limiting of the USB ports so they can provide 4x500mA, meeting the USB spec. The AP2253 power switch's current limiting can be set by a single resistor, anywhere from 10k $\Omega$  to 232k $\Omega$ . By removing R50 and R4, and replacing R50 with a 10k $\Omega$  resistor, the current limiting of the AP2253 switch will be set to its maximum, 2.1A. Divide that by four, and you have 500mA per port, just like every other computer on the planet.

There is a reason the Raspberry Pi foundation set the current limiting of the USB ports so low. The Pi was originally intended to run off of a micro USB phone charger. There aren't many phone chargers out there that will supply more than 1A, and the CPU and related peripherals will take half of that. If you're going to change the /boot/config.txt file, you're going to need a beefy power supply. Increasing the current limiting of the USB ports to 2A will require an even bigger, beefier supply.

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