USB In-rush current protection

These days, we will see many products powered through USB and that's because of lower power consumption of integrated circuits plus a lot of low power techniques.

But USB standard imposes some more constraints and limitations on the USB bus, which can be problematic for the electronic designers.

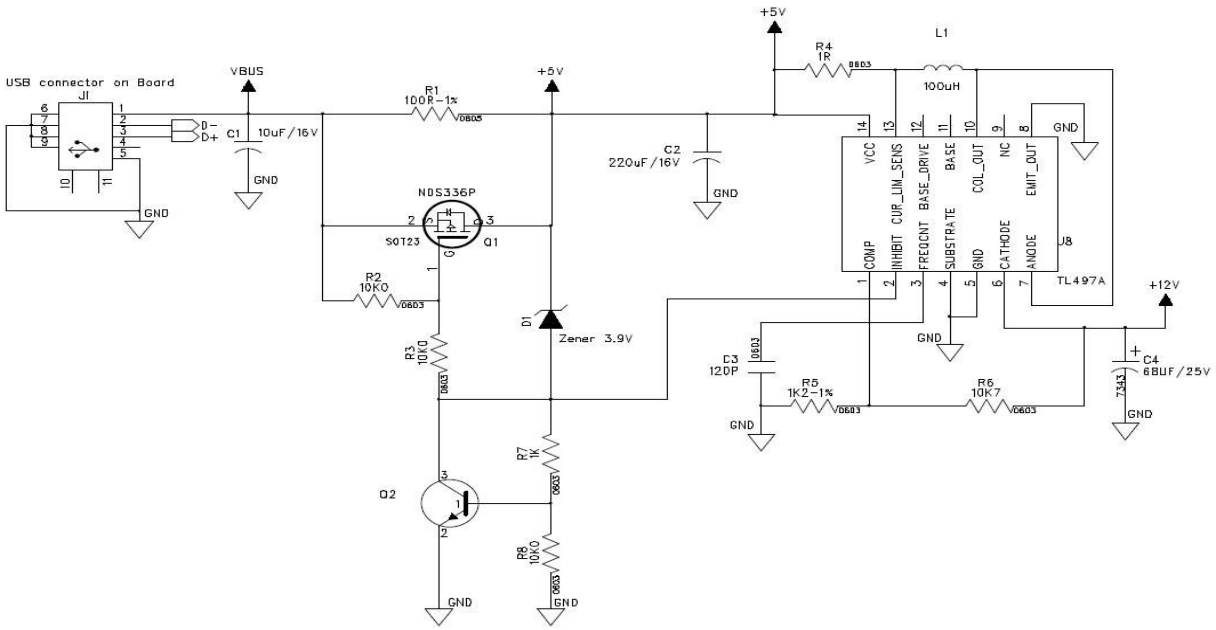
One of these limitations is the amount of Capacitance on VBUS, which must be less than 10 micro-farads. Obviously this limitation is because of the amount of inrush current; when we hook-up the USB cable into our device, high value of capacitance causes higher value in inrush current.

Assume you want to connect the VBUS to the input of a DC/DC converter such as a step-up converter to push the voltage up to higher values. Then you will get into trouble, since 10 micro Farad capacitance on the input line of DC/DC converter in not enough to reduce the noise induced by DC/DC converter. In the other hand the noise generated by DC/DC converter will get into the 5V voltage rail and affect the circuit and/or the PC USB circuitry.

<u>Here is the solution:</u>

Use a P-MOSFET switch to keep the VBUS disconnected from the higher value capacitance and when the capacitor charged enough through a leakage resistance switch will be connected.

To let the C2 be charged properly we have to keep the DC/DC converter off while it is charging. So the circuit below does the job:



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