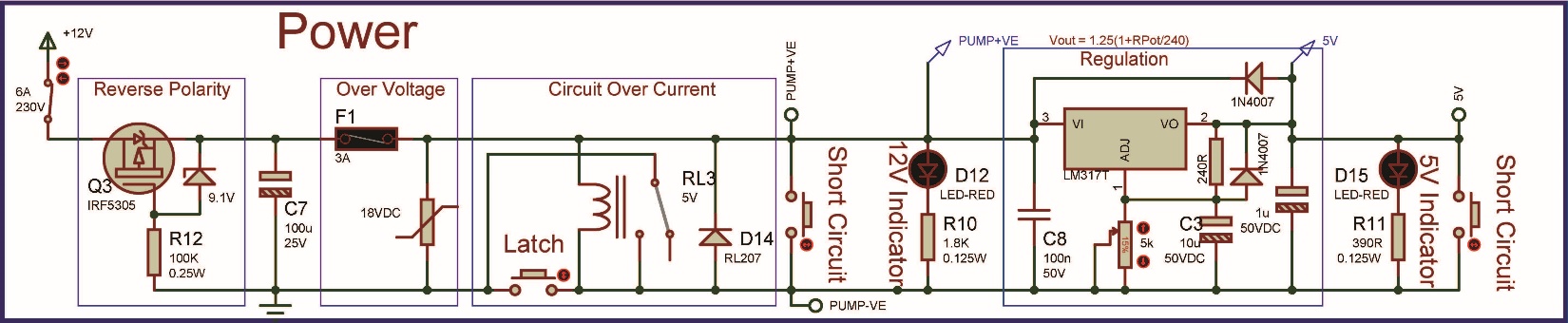
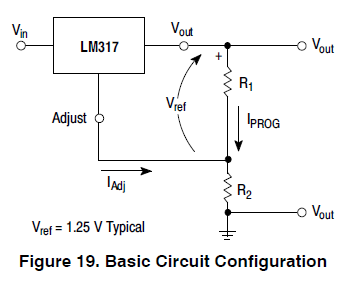
**Variable PSU with LM317T**

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**LM317:**

**Basics of LM317:**

**It’s:**

1. Short circuit proof (shutdown).
2. Over temperature shutdown.
3. Floating Operation for High Voltages.

LM317 generate a difference of 1.25V between and pins (.

∵

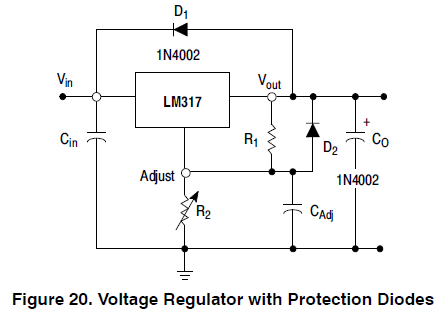
∵ substitute

∴

Because is constant and must be constant. So, must be constant, and then, we can control the O/P with value.

But the term is not desired cuz we can’t control it. So, LM317 control it to be less than 100uA which is negligible. So:

Often, which give the best results.

** Tips for LM317 circuit design:**

**selection:**

should make (max of IC )

∵

∴

Often, give the best results.

∴

* We need . So, we will put a fixed resistor with the trimmer in case of making it’s resistor = 0.
* Cuz we don’t need to reach 37V in practical apps, we will choose the value of the trimmer to be = 5KΩ, making

**Capacitors:**

1. of (0.1uF disc or 1.0uF tantalum) is recommended to reduce the sensitivity to input line impedance.
2. is recommended to bypass the adjustment terminal to ground to improve ripple rejection. It prevents ripple being amplified as the output voltage is increased. A 10uF disc capacitor improves ripple rejection about 15 dB at 120 Hz in a 10 V application.
3. LM317 is stable with no output capacitance. But certain values of external capacitance can cause excessive ringing. of (1.0uF tantalum or 25uF aluminum electrolytic) swamps this effect and insures stability.

**Protection Diodes:**

Protection diodes must be used when capacitors are used to prevent discharging through low current points into the regulator.

1. prevents discharging thru the IC during an I/P short circuit.
2. prevents discharging thru the IC during an O/P short circuit.
3. with prevents discharging thru the IC during an I/P short circuit.

**When**

LM317 can have its output shorted without damage. But . So, applying 45V to the input, and getting 30V from the output. A 15V appears over the IC which is fine, but if the output gets shorted somehow (i.e. the initial charging of large capacitors ), a full 45V appears above the IC and this is enough to damage it(>40V).

[**Solution**:](https://electronics.stackexchange.com/questions/148340/how-to-protect-lm317-from-output-short/148342#148342)

Replace D1 with a 30V zener rated for several amps(P6KE30A), and a fuse (before Vin) to blow before the zener.

* Normal operation: the zener should not normally conduct.
* Power-off operation: the zener is forward biassed providing the same protection D1 does.
* Power-on operation: with 45V in, the zener will supply current to the load if the LM317 is supplying less than 15V. After that, the LM317 takes over.
* Short circuit operation: the IC goes into current limit and the output voltage drops. The zener conducts before I/O voltage exceeds 40V. The fuse blows.

**Tips for LM317 PCB design:**

1. should be connected close to the regulator pins to minimize line drops which appears in series with , thereby degrading regulation.
2. The ground end of should be connected close to the load ground to provide remote ground sensing and improve load regulation.
3. and should be connected close to the IC pins to avoid stray inductance.

Resources:

LM317: 🡺 Basic : [(39) LM317: How It Works and Why You Need It (Ep. 2) - YouTube](https://www.youtube.com/watch?v=Kw1IxR5K_gk)

🡺 Increase current: [(39) LM317: How To Increase Amperage (Ep. 3) - YouTube](https://www.youtube.com/watch?v=2W51oVesKP8)