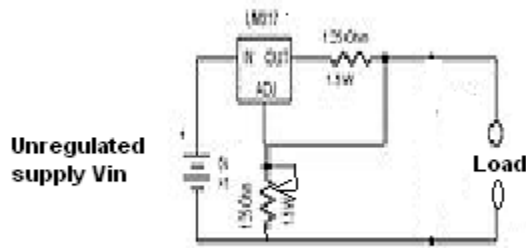


ADJUSTABLE POSITIVE VOLTAGE REGULATOR (LM317)



- LM317 series adjustable 3 terminal positive voltage regulator, the three terminals are Vin, Vout & adjustment (ADJ).
- LM317 requires only 2 external resistors to set the output voltage.
- LM317 produces a voltage of 1.25v between its output & adjustment terminals. This voltage is called as Vref.
- Vref (Reference Voltage) is a constant, hence current I1 flows through R1 will also be constant. Because resistor R1 sets current I1. It is called “current set” or “program resistor”.
- Resistor R2 is called as “Output set” resistors, hence current through this resistor is the sum of I1 & Iadj
- LM317 is designed in such as that Iadj is very small & constant with changes in line voltage & load current.
- The output voltage Vo is, $V_o = R_1 I_1 + (I_1 + I_{adj}) R_2$ ----- (1)

Where $I_1 = V_{ref} / R_1$

$$\begin{aligned} V_o &= (V_{ref} / R_1) R_1 + V_{ref} / R_1 + I_{adj} R_2 \\ &= V_{ref} + (V_{ref} / R_1) R_2 + I_{adj} R_2 \end{aligned}$$

$$V_o = V_{ref} [1 + R_2 / R_1] + I_{adj} R_2 \quad \text{----- (2)}$$

R1 = Current (I1) set resistor

R2 = output (Vo) set resistor

Vref = 1.25v which is a constant voltage between output and ADJ terminals.

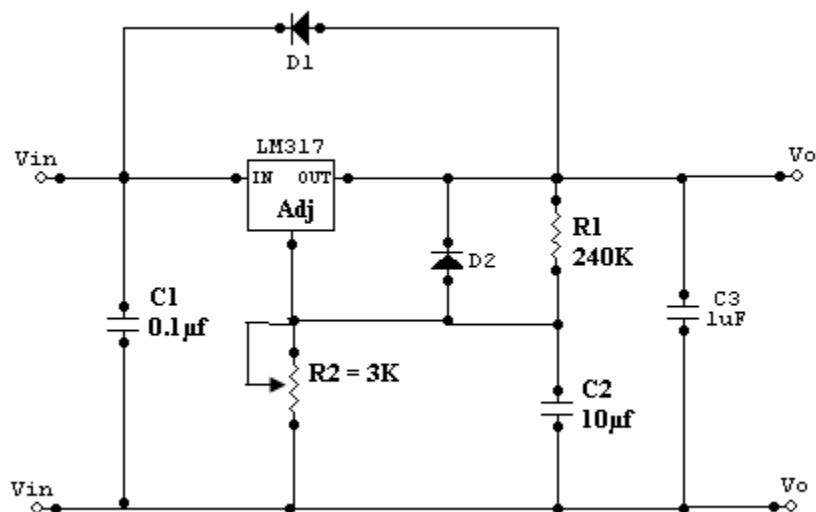
- Current Iadj is very small. Therefore the second term in (2) can be neglected.
- Thus the final expression for the output voltage is given by

$$V_o = 1.25v[1 + R_2/R_1] \quad \text{-----} \quad (3)$$

Eqn (3) indicates that we can vary the output voltage by varying the resistance R2.

The value of R1 is normally kept constant at 240 ohms for all practical applications.

Practical Regulator using LM317:



- If LM317 is far away from the input power supply, then 0.1 μ f disc type or 1 μ f tantalum capacitor should be used at the input of LM317.
- The output capacitor C_o is optional. C_o should be in the range of 1 to 1000 μ f.
- The adjustment terminal is bypassed with a capacitor C_2 this will improve the ripple rejection ratio as high as 80 dB is obtainable at any output level.
- When the filter capacitor is used, it is necessary to use the protective diodes.
- These diodes do not allow the capacitor C_2 to discharge through the low current point of the regulator.
- These diodes are required only for high output voltages (above 25v) & for higher values of output capacitance 25 μ f and above.

Source : <https://aihteienotes.files.wordpress.com/2014/07/lic-notes.doc>