Voltage Regulator with Current Limit using LM741

Submitted by,

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Aim :

Design and implement a 5V regulated DC power supply with current limiting of 14mA.

Components required :

BC547(3),1N750(1),LM741(1),1K Ohm(3),4.7K Ohm(1),49.9 Ohm(1),100 Ohm(1),4.7k Pot(Load)

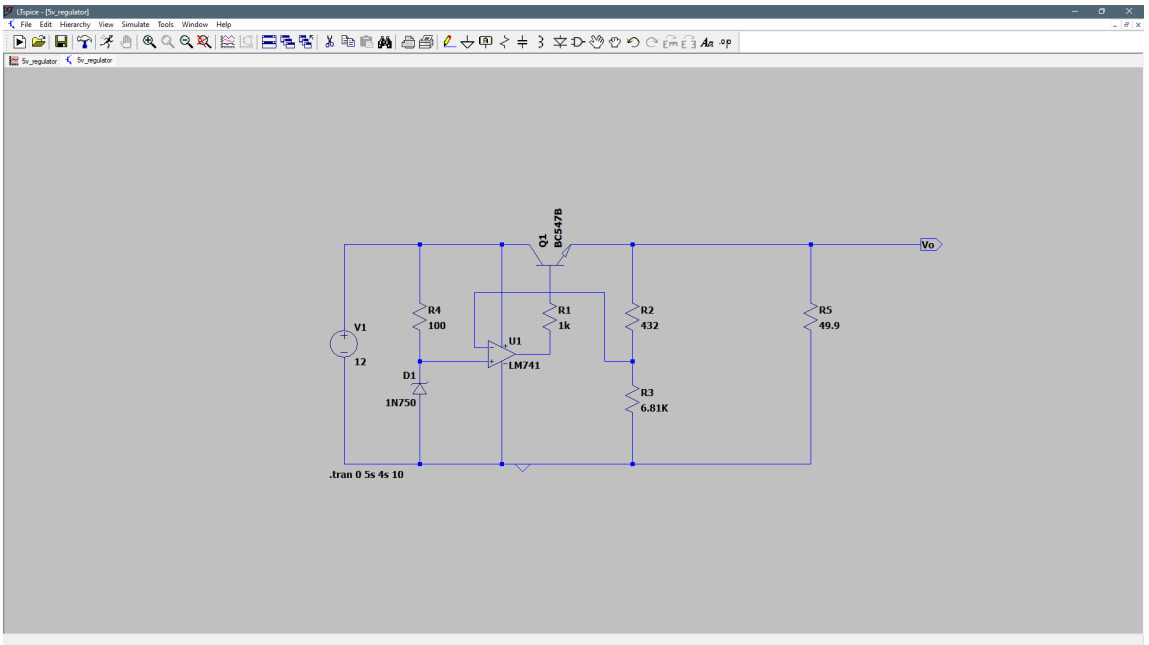
Design :

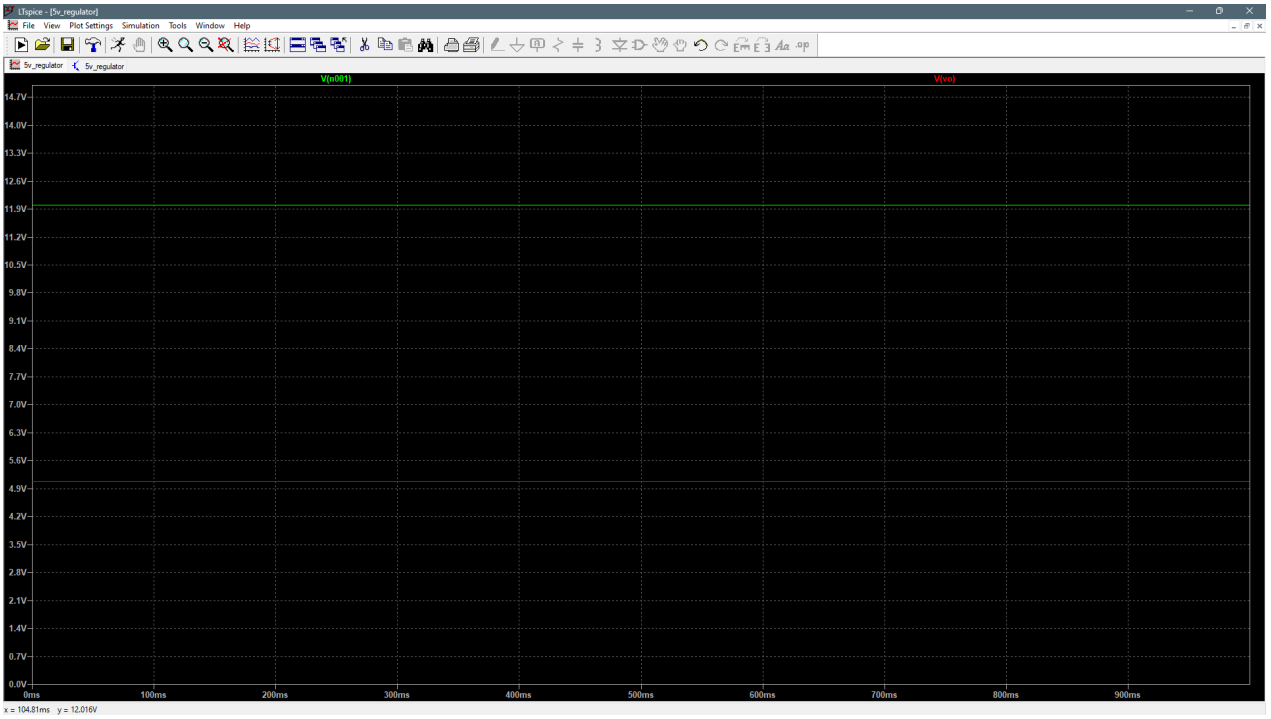
Base Circuit design for 5V :

Diode Voltage=4.7V
5x1/(x1+x2)=4.7
Let x2=6.8k Ohm
Then x1=430 Ohm

Now, Power rating for 1N750 =500mW
VI=500mW
Let Ilimit=70mA
Then assuming 12V supply ,12-4.7/R=73mA
R=100 Ohm

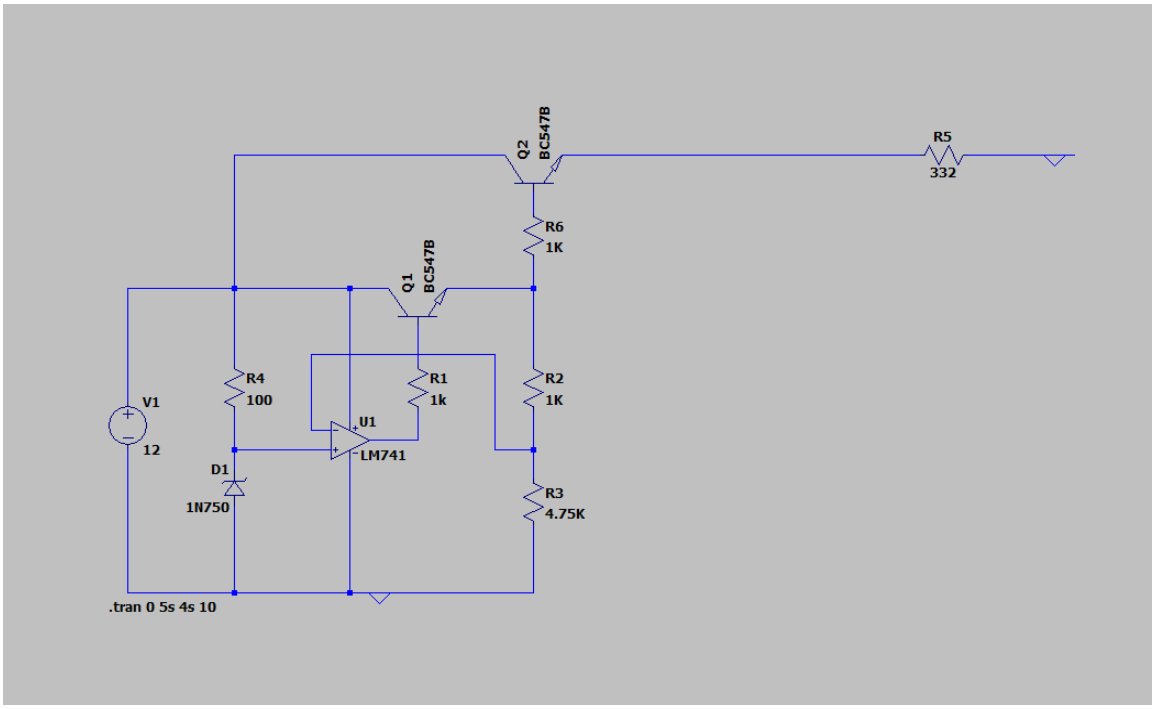
For limiting Current to the base of thee transistor,
(5.7-0.7)/R=5mA
R>=1K Ohm

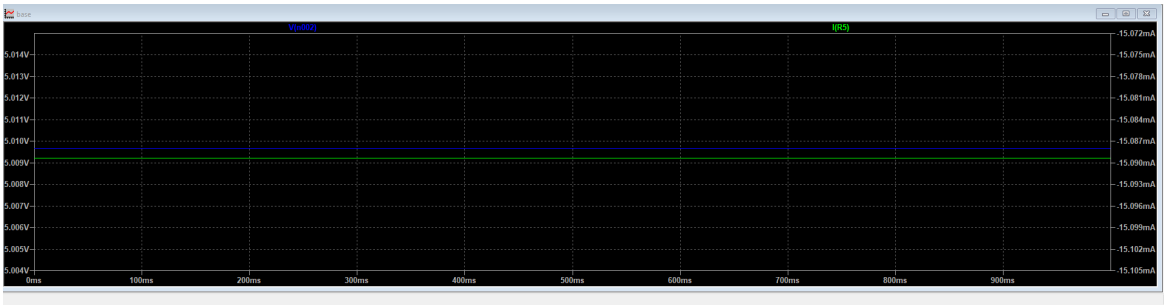




Current Boosting Circuit :

Inorder to boost the emitter current we use another transistor
ic=beta*ib
This amplifies the input current from Micro range to Milli Ampere range.
Rearranged the circuit for 5V at output
Then opamp out is redesigned for 5.7 at series transistor out.
Then x1=4.7K Ohm and x2=1K Ohm.



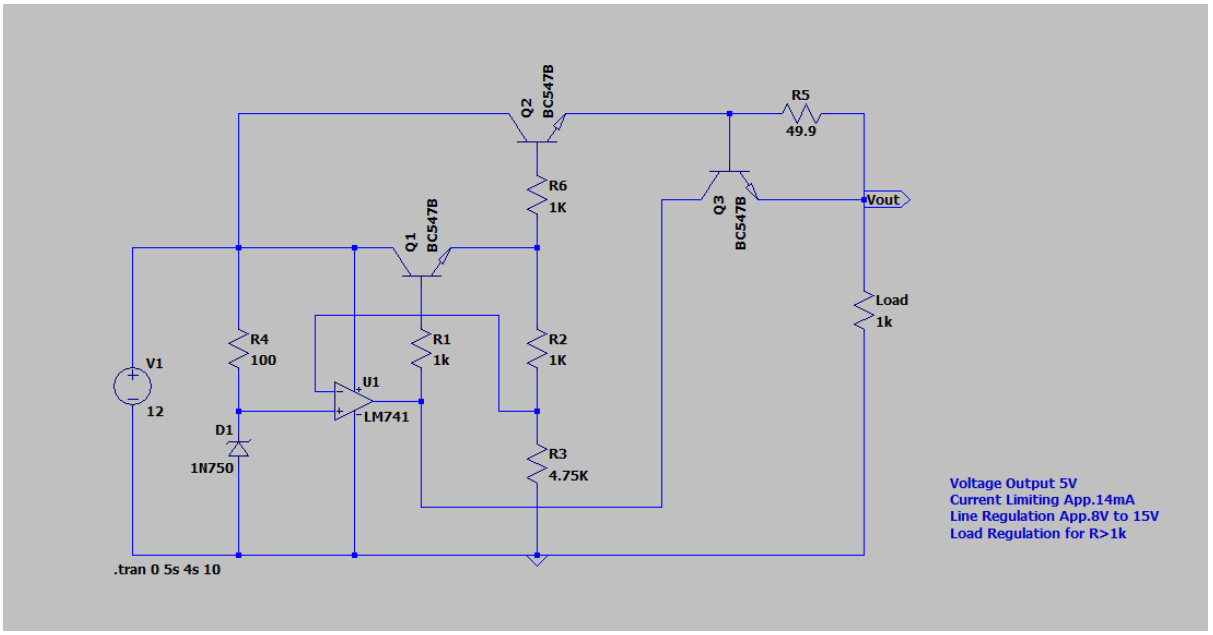


Current limiting circuit:

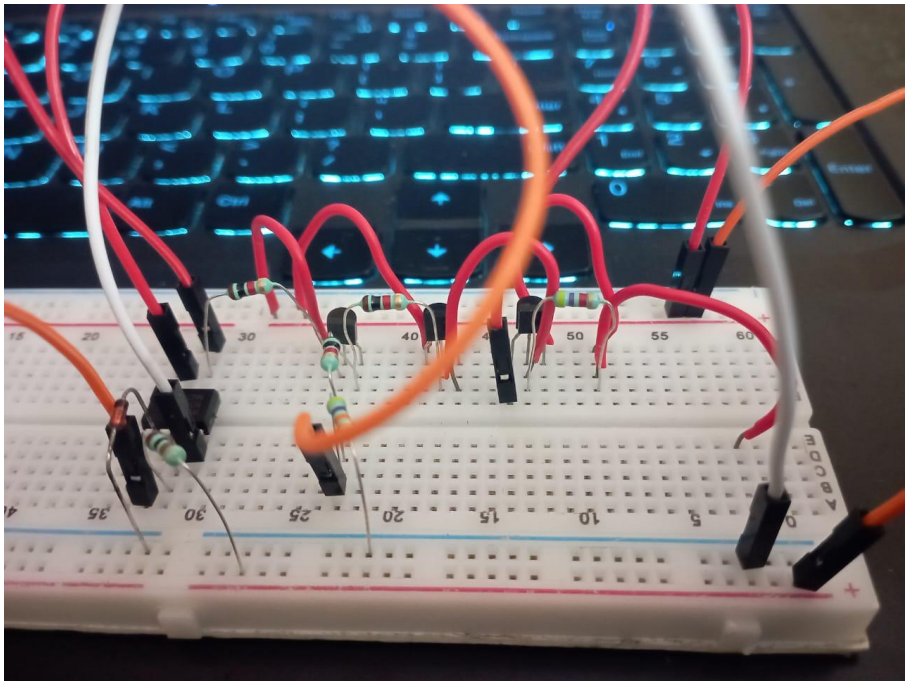
Current limiting using a resistor which will activate transistor connected with it if a current above 14mA passes through it.

0.7=14m*R

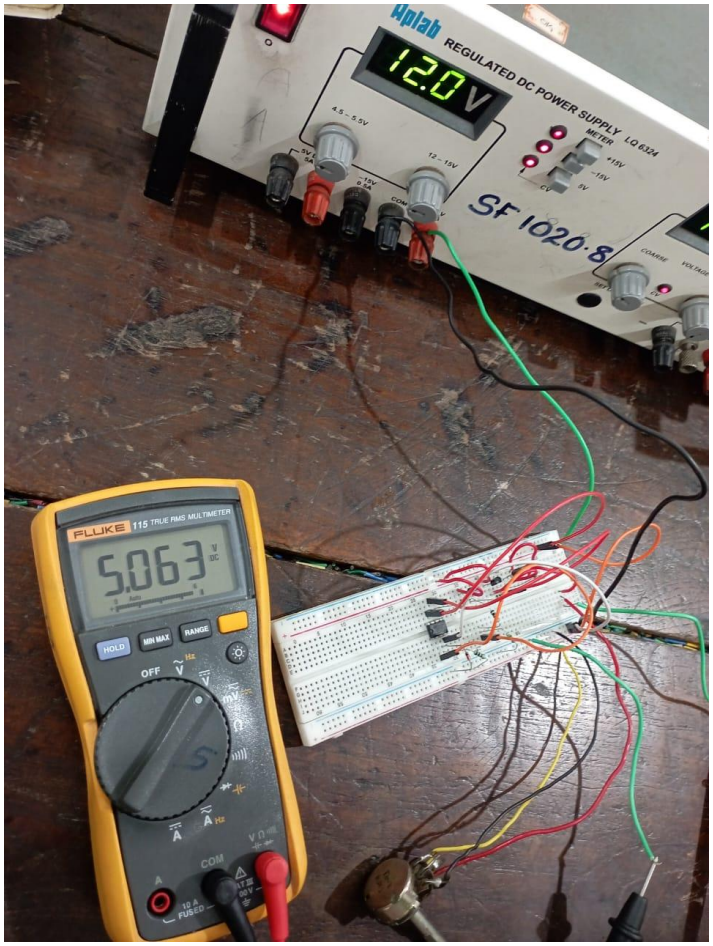
R=49.9 Ohm



Implementation :



Observation :



Result :

Designed and implemented a 5V DC regulated power supply with a current limiting circuit for 14 mA.

Reference :

BC547 : BC547 Datasheet (PDF) - Fairchild Semiconductor
1N750 : 1N750 Microchip Technology | Mouser India
LM741 : LM741 Operational Amplifier datasheet (Rev. D)
Base : Op Amp Regulators - EEEGUIDE.COM