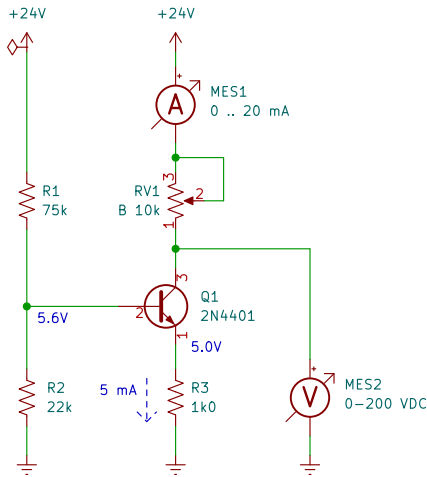


## Demonstration Current Source



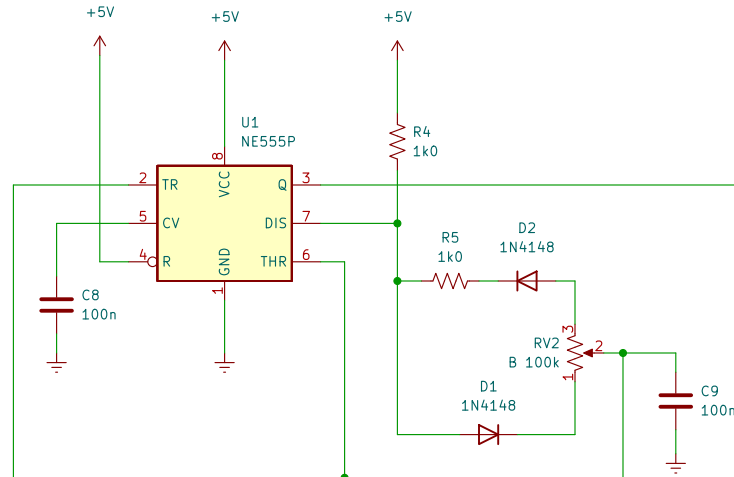
Note: +24 and ground in this circuit are wired to +12 and -12 on the breadboard!

With RV1 set between 0 and about 4400  $\Omega$ , observe that MES1 reading stays constant at about 5 mA.

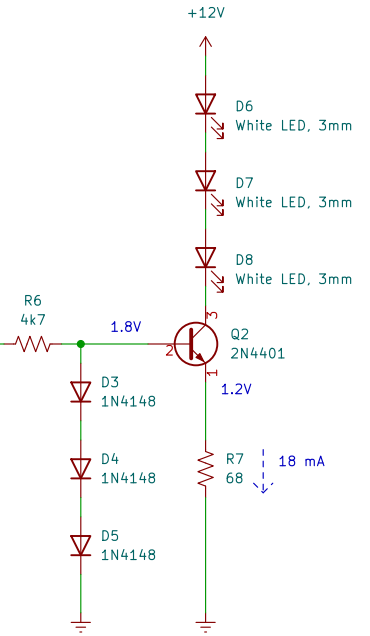
Whth RV1 higher, Q1 saturates and behaves like a small resistor.

At RV1 max value, we expect that current will fall to about 2.2 mA and MES2 will read about 2V.

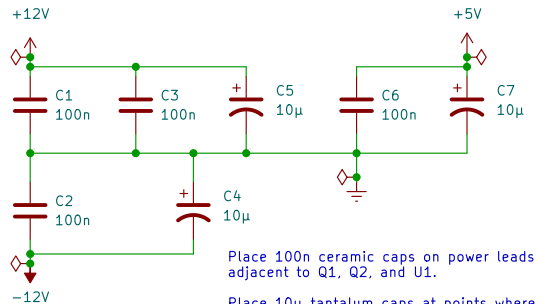
## Pulse Width Modulator (not discussed in video)



## Constant Current LED Driver



## Power and Bypassing



Place 100n ceramic caps on power leads adjacent to Q1, Q2, and U1.

Place 10 $\mu$  tantalum caps at points where power leads enter and leave the breadboard.

All resistors 1% metal film.  
C1, C2, C3, C6, C8 – X7R ceramic  
C4, C5, C7 – 50V tantalum  
C9 – polypropylene or polyester  
D6–D8 – White 3mm LED, rated at 3.0V voltage drop at 20 mA



Transistors 101  
Ep2 – Current Sources  
**Kludges from Kevin's Cave**

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