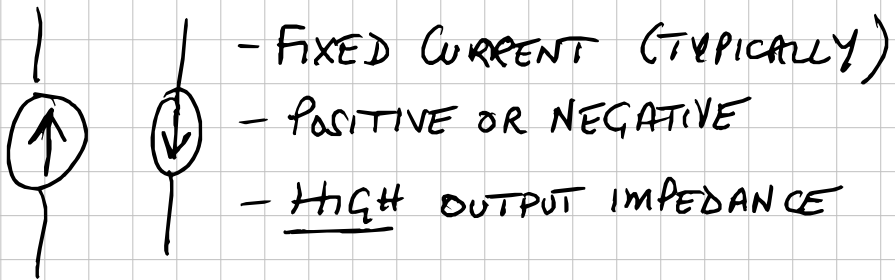


#327: Bipolar Transistor output impedance, Early Effect, Wilson Current Mirror

W2aew Youtube in #324 video
Alan calibrates his Simpson analog meter using $50\mu A$ current source - which uses a Wilson current mirror - improves the stability.

Review #190 Current sources and mirrors

Back to Basics - Transistor Current Sources.



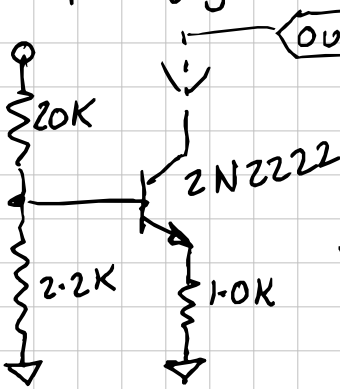
Applications

Drive LEDs, charge batteries, Sensor Driver.

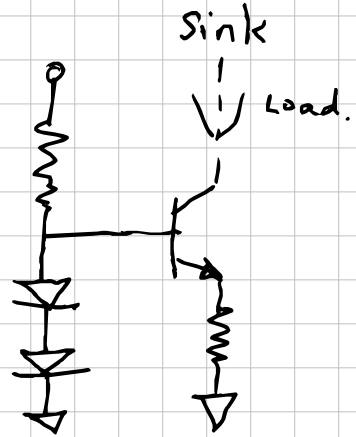
A fixed current across an unknown resistor allows you to measure the voltage across that resistor and calculate the resistance value.

Many configurations.

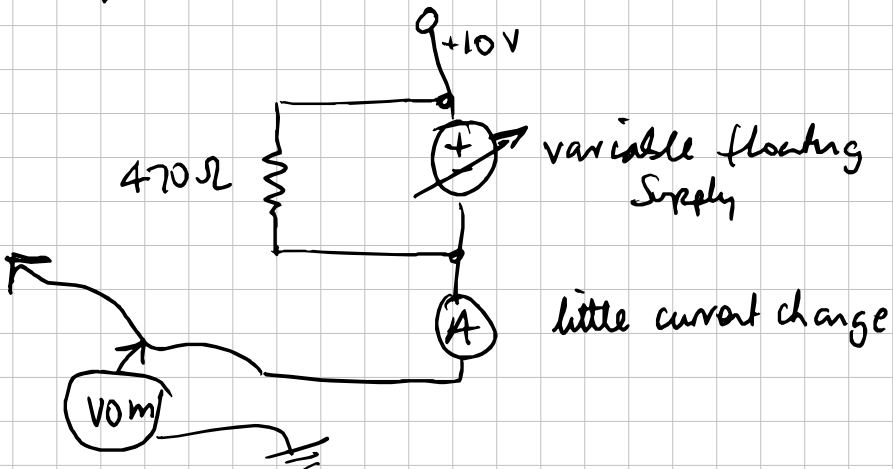
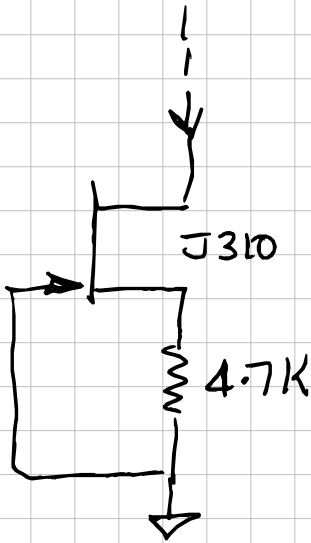
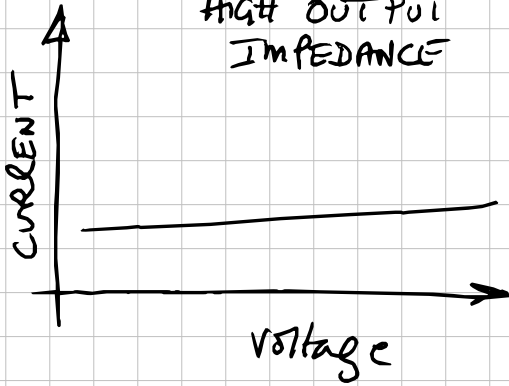
+10V

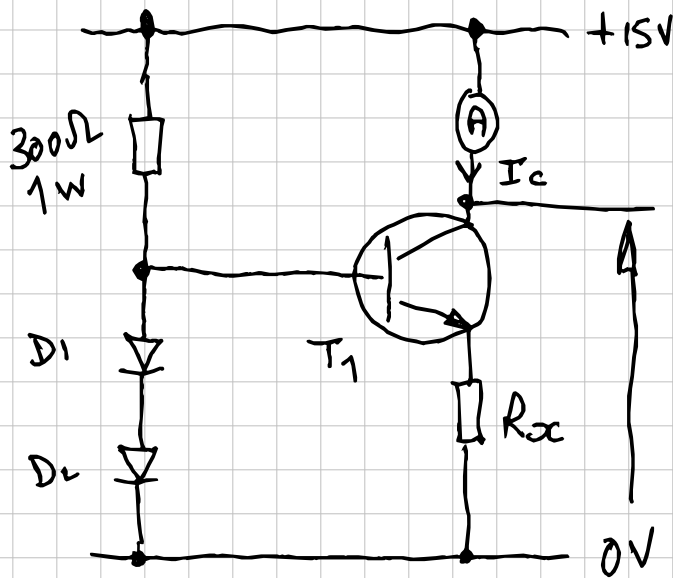


replace resistor
with a pair
of diodes
more immune
from power
supply variation.



"CURRENT SOURCE"
HIGH OUTPUT
IMPEDANCE



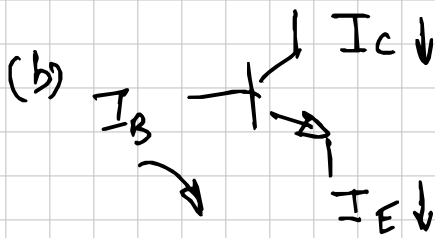


June 1981
GCE A Level
Electronic Systems
Paper 1 qu. 2

- The Current flowing through the silicon diodes D_1 and D_2 is approximately 45mA. Verify this statement and explain any assumptions you make.
- Calculate the value of R_{Lc} such that the ammeter A registers approximately 5mA.
- A 1000 μF capacitor is inserted in place of Ammeter A. Starting with zero charge on the capacitor draw graphs of V_{out} and I_c against a base of time over the period 0-5 seconds.

Ans (a) bias voltage is 1.4V, $[2 \times 0.7 \text{ V}]$ and assumption 0.7V for each diode and current flowing through the silicon diodes is approximately equal to that flowing in the 300Ω , assuming bias current is small in comparison to it.

$$I = 13.6 / 300 = 45.3 \text{ mA}$$



$$I_C = \beta I_B$$

$$I_E = I_C + I_B$$

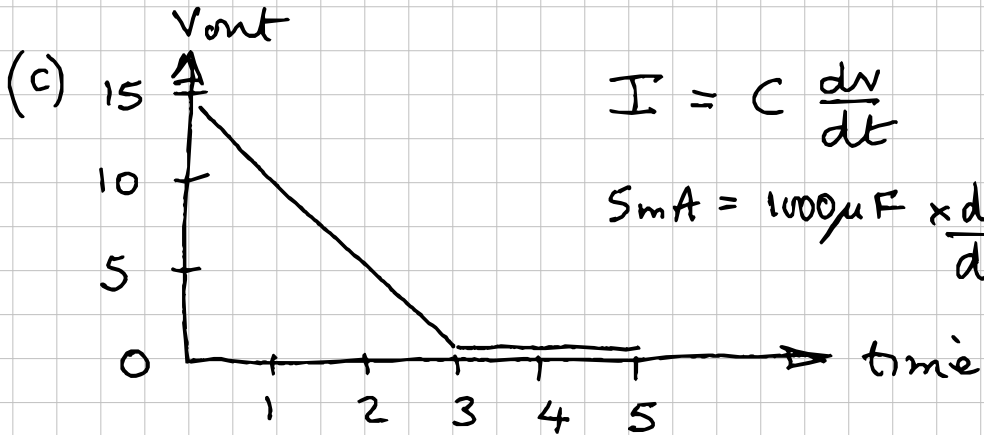
$$I_E = (1 + \beta) I_B$$

$$I_C \approx \frac{(V_B - 0.7V)}{R_E}$$

$$\Rightarrow R_E = \frac{V_B - 0.7V}{I_C}$$

for $I_C = 5\text{mA}$

$$R_E \approx \frac{1.4 - 0.7}{0.005} = 140\Omega$$



$$I = C \frac{dv}{dt}$$

$$5\text{mA} = 1000\mu\text{F} \times \frac{dv}{dt}$$

$$\Rightarrow \frac{dv}{dt} = 5\text{V/s}$$

