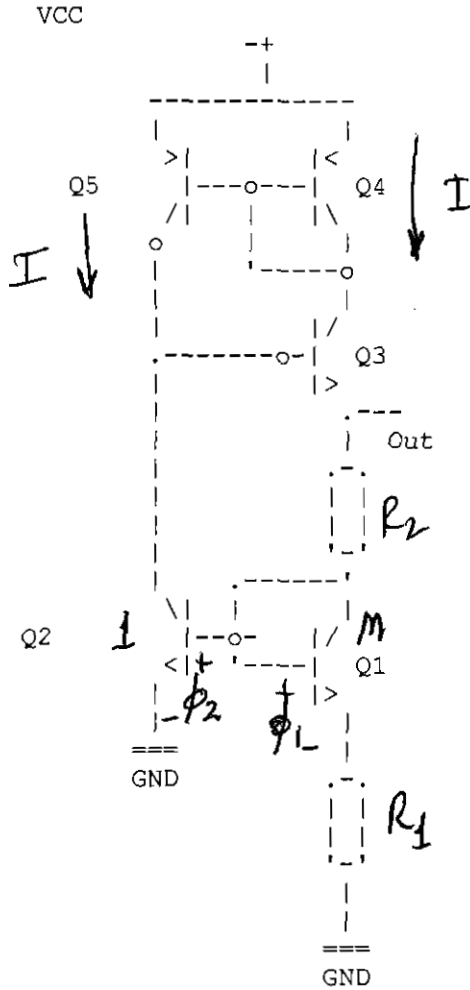


I was looking through some of the example circuits that come with LTSpice, and there's a file with some bandgap voltage references. I'm unfamiliar with the current mirror arrangement in the following schematic...the transistor directly above Out is an NPN, not the PNP I would expect for something like a Wilson current mirror. If I switch it to a PNP, the circuit doesn't work properly anymore. For the bandgap to work properly I'm assuming that Q1 must have a larger emitter area than Q2 to generate a  $V_{be}$  differential. Any insight would be appreciated!



$$\phi_1 = \frac{kT}{q} \ln \frac{I}{M \cdot I_{S1}}$$

$$\phi_2 = \frac{kT}{q} \ln \frac{I}{I_{S2}}$$

$$\phi_1 + I R_1 = \phi_2$$

$$I R_1 = \phi_2 - \phi_1 = \frac{kT}{q} \ln M$$

$$V_{OUT} = I(R_1 + R_2) + \phi_1$$

$$\text{DEFINE } \dot{X} = \frac{dX}{dT}$$

$$\dot{V}_{OUT} = \dot{I}(R_1 + R_2) + \dot{\phi}_1 = 0 \quad \text{IF FLAT} = 0$$

$$\dot{I} = \frac{k}{q R_1} \ln M$$

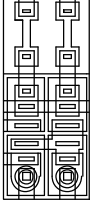
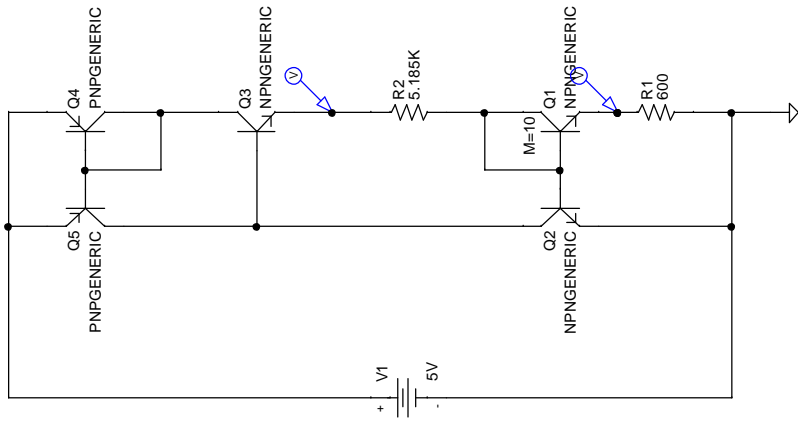
$$0 = \frac{k}{q R_1} (\ln M)(R_1 + R_2) - 2 \text{mV}/^\circ\text{C}$$

SOLVE VIA NEWTON'S METHOD OF SUCCESSIVE

APPROXIMATION, OR TWEAK VIA A SIMULATOR

SEE FOLLOWING PAGES.

BASIC TC (Si)  
FOR P-N JUNCTIONS



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Title: Bandgaps	
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Sheet 1 of 1	

