

EE5390 : Analog IC Design

Project 2 (due on 30th April 2012)

Bandgap reference : Bias a 1x sized diode connected PNP (Use the model `ideal_pnp` in `ideal_diode.lib`) at $5 \mu\text{A}$ as shown in Fig. 1 and sweep the temperature from 0 to 100 °C. Determine $\frac{dV_{BE}}{dT}$ at 27°C. Design the bandgap shown in Fig. 2(c). Choose R1 for a quiescent current of $5 \mu\text{A}$ and R2 to get zero temperature coefficient at V_{bg} . Choose R3 = R2. What is the role of R3 ? Simulate the bandgap reference with the model of a single stage opamp assuming that the single stage opamp is made like the first stage of the previous problem. (Fig. 2(b)-model the gm, and the pole zero doublet). Choose Cc for ringing $\leq 10\%$. Test the bandgap reference by sweeping the temperature from 0 to 100 °C and plot V_{bg} . Test the transient response by applying a $1 \mu\text{A}$ pulse to the output of the opamp. Adjust the values of R1 R2 , R3 (= R2) if necessary to get zero TC at 27 °C.

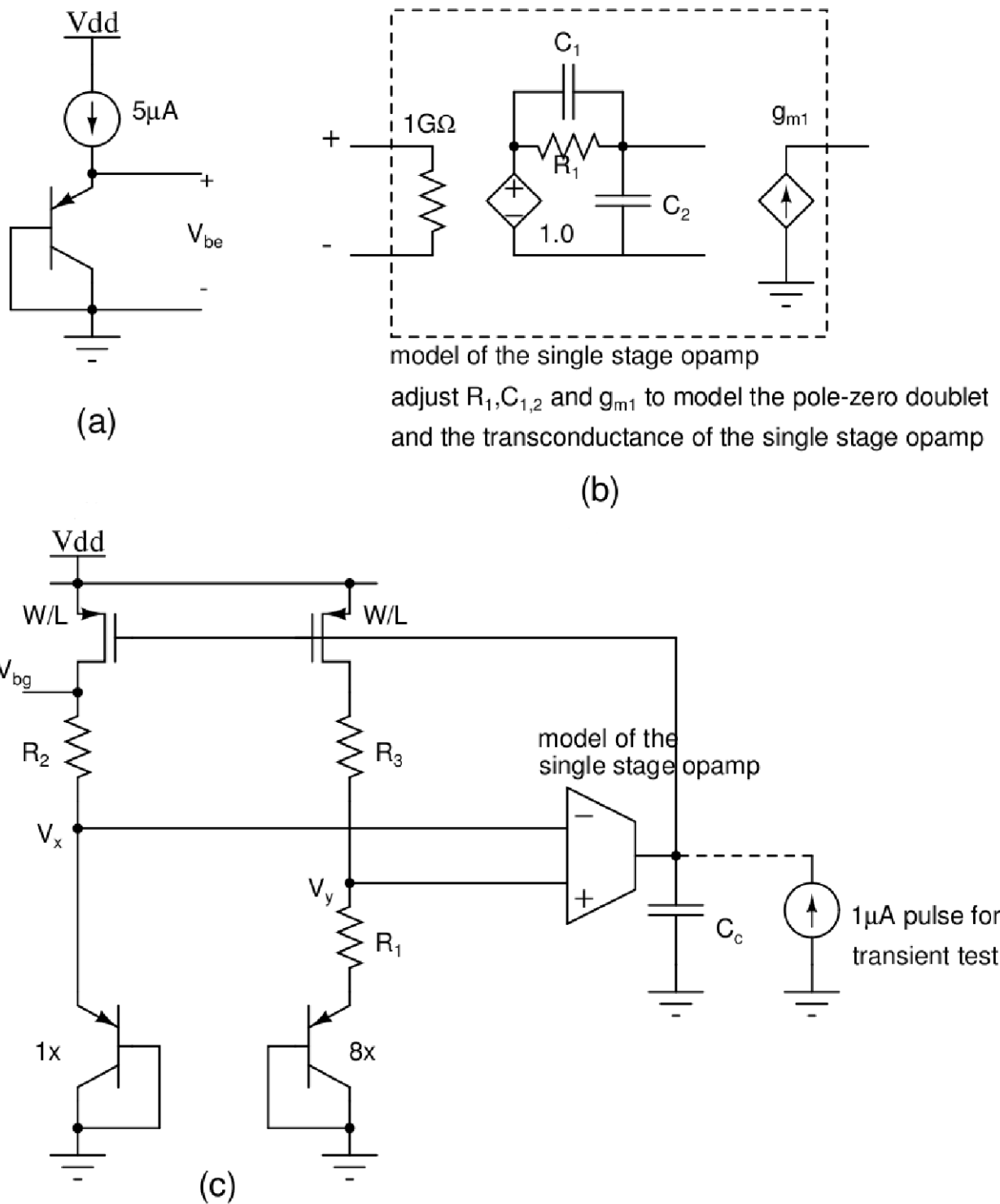


Fig. 1. Bandgap reference