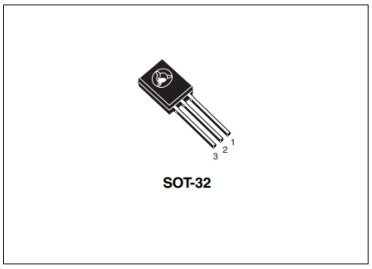
Dele Ayeni

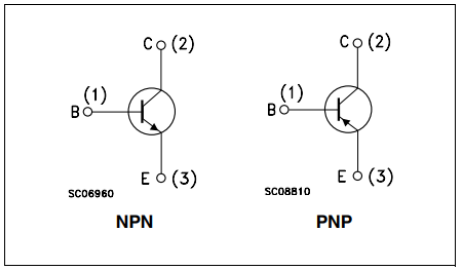
Transistor Lab 3 Preparation

Class B amplifier

Preparation1: Look up the datasheet of the BD139 and BD140.

- Note down the pinning of these transistors.





- How much is the maximum allowed collector current?
  - BD139: 1.5 A
  - BD140: -1.5 A
- How much is maximum allowed emitter-collector voltage?
  - BD139: 80 V
  - BD140: -80 V
- How much is β? Compare to the β of the BC547 transistor
  - BD139:
  - BD140:

h_{FE} (1)	h_{FE} groups	NPN	I_C = 150 mA, V_{CE} = 2 V BD139-10 BD135-16/BD139-16	 63 100		 160 250	
		PNP	I_C = -150 mA, V_{CE} = -2 V BD140-10 BD136-16/BD140-16	 63 100		 160 250	

β is represented by the symbol h_{FE}. This term refers to the ratio of the collector current (I_C) to the base current (I_B) under certain conditions. The datasheet provides h_{FE} values under specific test conditions, such as a particular collector current (I_C) and a collector-emitter voltage (V_{CE}).

Preparation2: How much is the voltage gain of this circuit?

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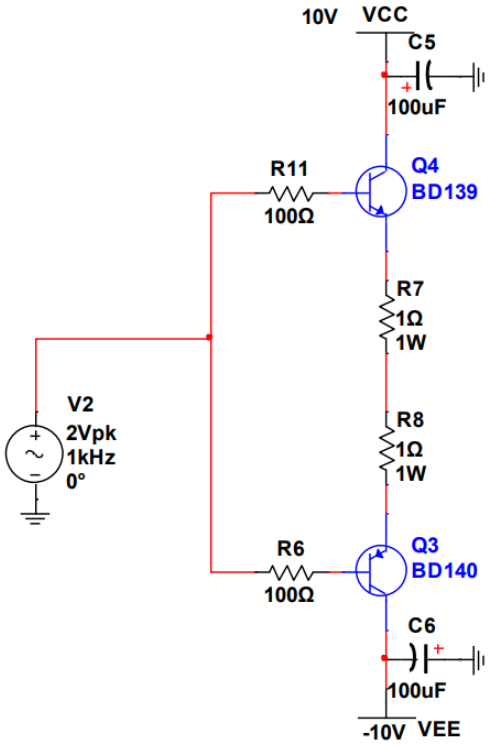

The voltage gain is 1.

Preparation3: The load resistor available in the lab is rated 50W, but this is overkill. What's the minimal power needed for the load resistor?

$$R_L = 12\ \Omega$$

Maximum allowed current is 1.5 A

$$Power = \ R * I^2$$

$$Power = 12 * 1.5^2 = 27\ W$$

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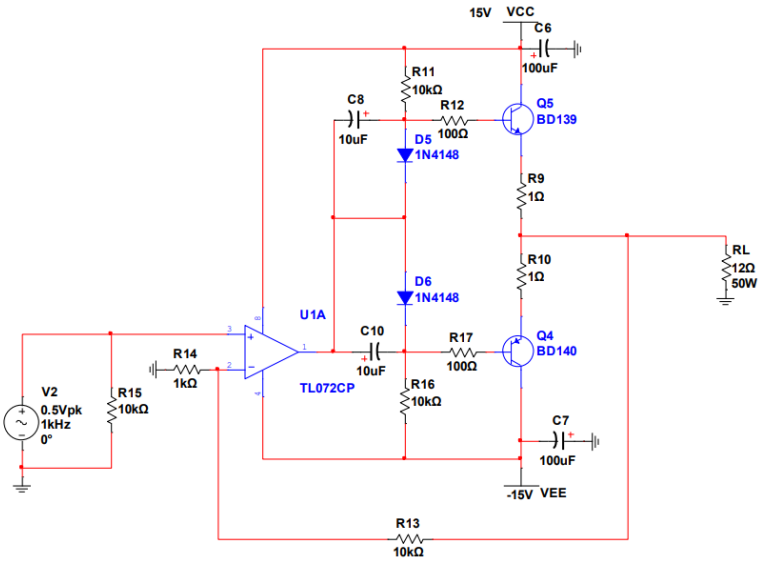
Audio amplifier



Preparation4: How much is the voltage gain of the total circuit?

This is a non inverting amplifier

$$A = 1 + \frac{R13}{R14}$$

$$A = 1 + \frac{10\ k\Omega}{1\ k\Omega} = 11\ V/V$$

Current Source

LED of 1W (I_{LED} = 300mA). Active region. Base-emitter voltage of almost 0.6 V

Preparation5: Calculate R2 with the info you can find above.

$$R_2 = \frac{0.6\ V}{300\ mA}$$

$$R_2 = 2\ \Omega$$

Preparation6: Build the circuit in Multisim and check the operation of the circuit.

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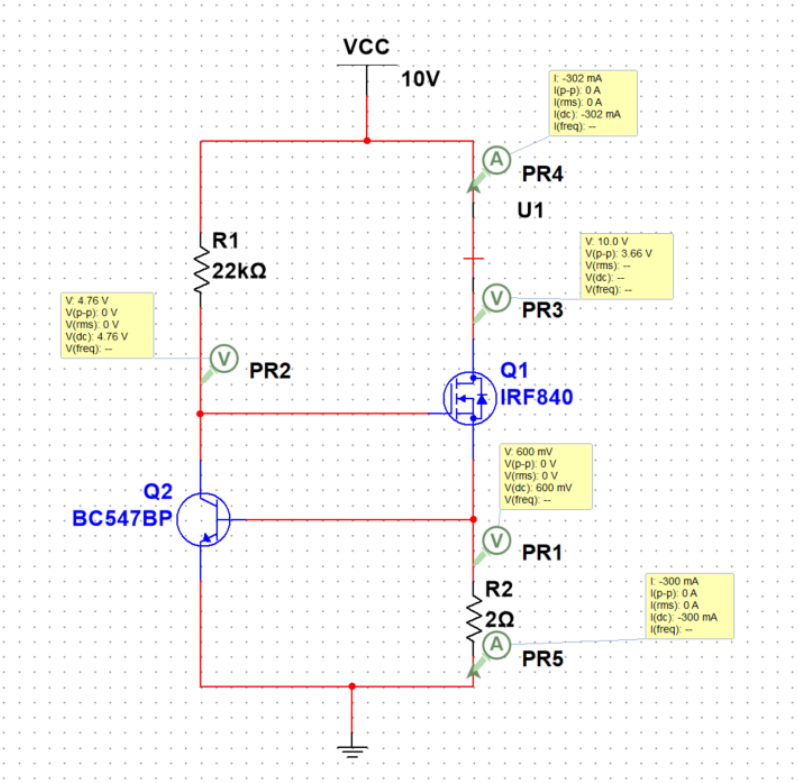
VCC
10V
I: -302 mA
I(p-p): 0 A
I(rms): 0 A
I(dc): -302 mA
I(freq): --
PR4
U1
R1
22kΩ
V: 10.0 V
V(p-p): 3.66 V
V(rms): --
V(dc): --
V(freq): --
PR3
V: 4.76 V
V(p-p): 0 V
V(rms): 0 V
V(dc): 4.76 V
V(freq): --
PR2
Q1
IRF840
V: 600 mV
V(p-p): 0 V
V(rms): 0 V
V(dc): 600 mV
V(freq): --
Q2
BC547BP
PR1
R2
2Ω
I: -300 mA
I(p-p): 0 A
I(rms): 0 A
I(dc): -300 mA
I(freq): --
PR5