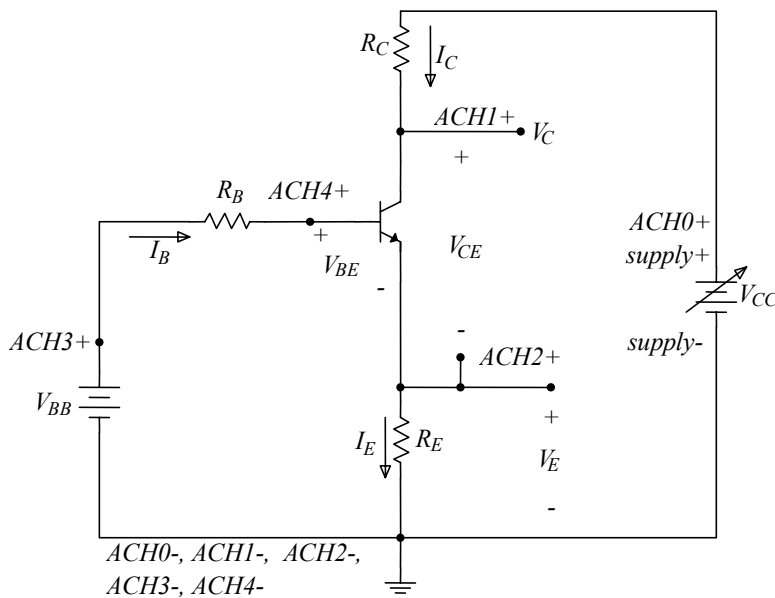# MASSACHUSETTS INSTITUTE OF TECHNOLOGY
6.071 Introduction to Electronics, Signals and Measurement
Spring 2006

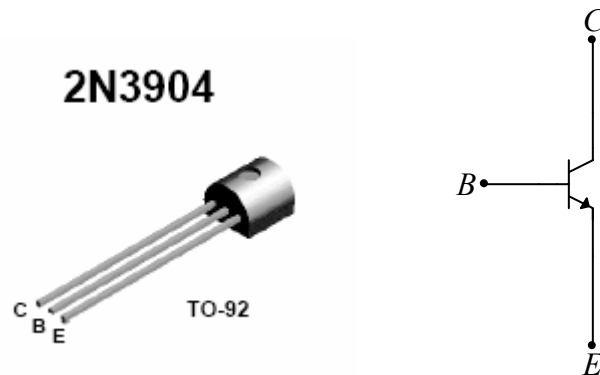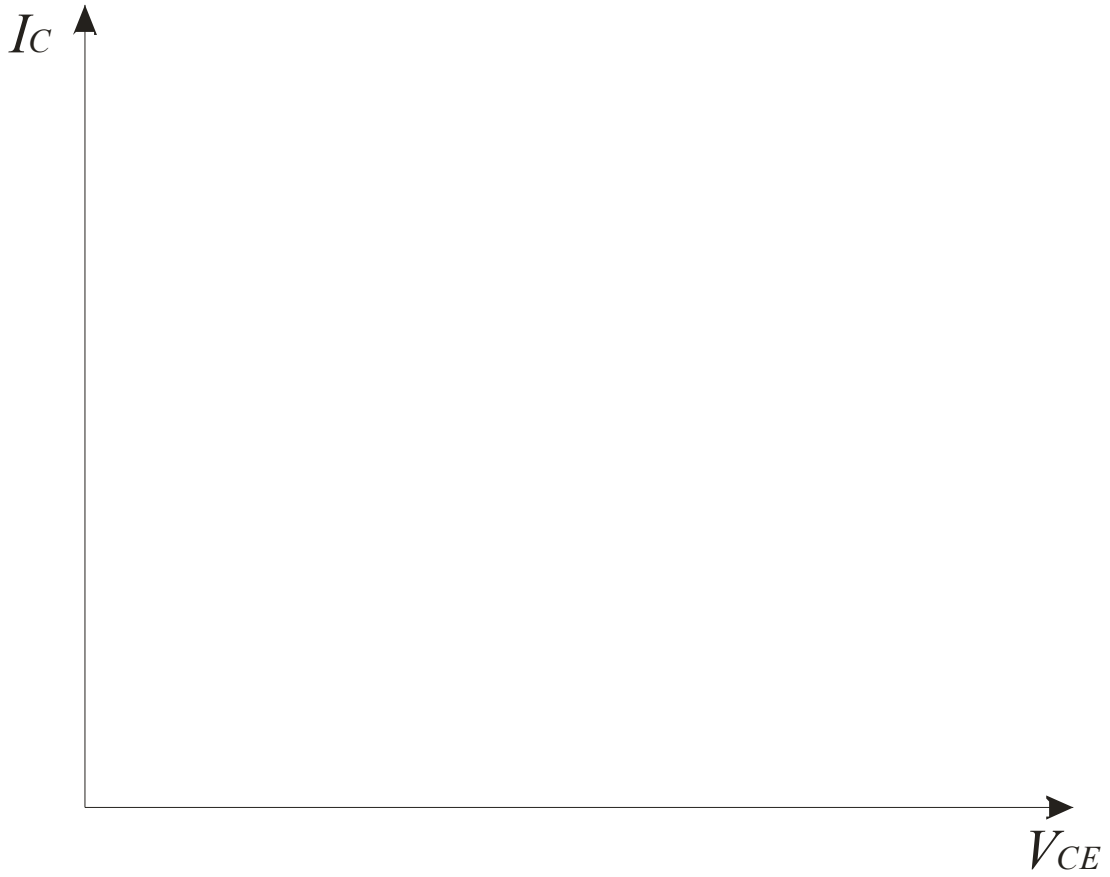### *Laboratory 18: Introduction to BJT*

Exercise 1.

For this exercise, our first encounter with the BJT, we will explore its i-v characteristics with the aide of a prepared instrument. The instrument is called **BJT1.vi** and it is available for download from the Labs section.

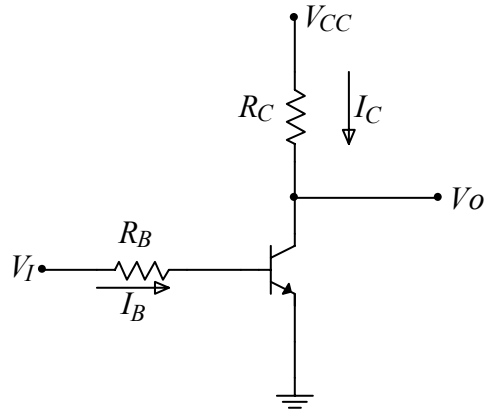Build the circuit shown below and make the connections as indicated on the schematic.

For the transistor we are using the 2N3904 npn BJT whose pinout is

First look over the data sheet for the 2N3904 npn transistor and note the relevant operating and maximum characteristics.

Find and list the values of the following parameters.

1. Maximum collector-emitter voltage:

2. Maximum collector current:

3. Transistor β (listed as h_{FE}):

4. Base-emitter saturation voltage:

5. Collector emitter saturation voltage:

Open the instrument **BJT1.vi** and note that it requires you to enter the values for the resistors Rc and RB. For RB use 100kΩ, and Rc=100 Ω and RE=2kΩ.

Run the instrument, vary Vcc (do not exceed 10 Volts – the data acquisition system has been setup for the range -10V to +10V) and collect data and plot IC versus VCE for three different values of VBB (5V, 8V and 10V). From the data estimate the value of β.

VBB	VC	IC

I_C

V_{CE}

Exercise 2.

Build the circuit shown below with RC=2kΩ and RB=100kΩ.

For V_I use the variable power supply (supply+) and measure it and the voltage Vo with the oscilloscope.

For Vcc use +5 Volts.

Collect the data and plot them on the figure below. Indicate the relevant parameters and regions of operation.
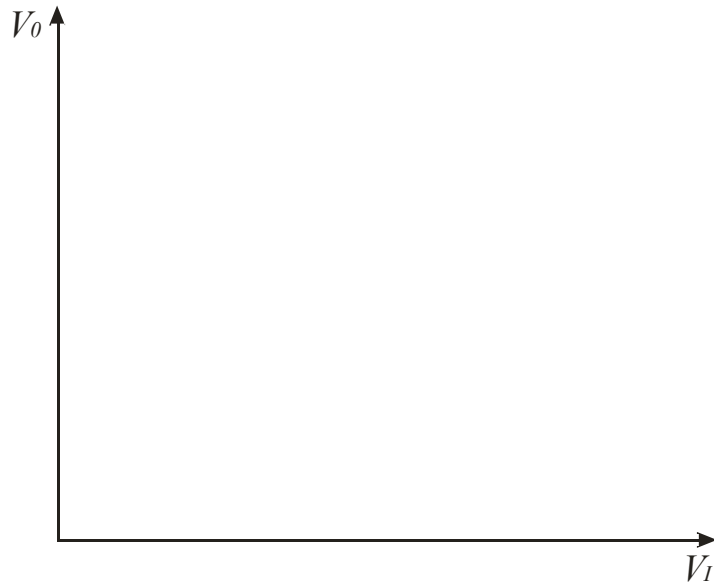
Exercise 3. (For extra credit and only if you have time)

Now let's build the flashing circuit using a BJT. The circuit is shown below. For V_I use a square wave varying between 0 and 5 Volts and observe the output.
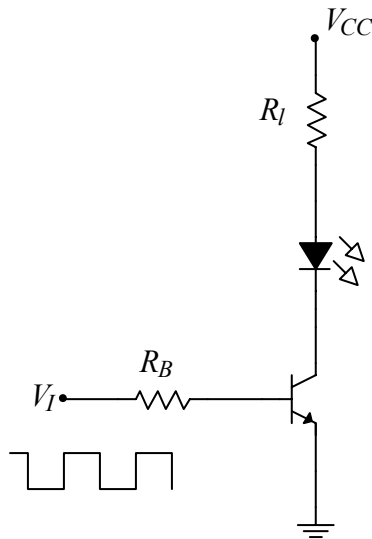
How does this compare with the diode flasher circuit that you tested previously?