Electrical and Computer Engineering Department

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ECE 2200L:

Experiment Number 7

Large Signal Characteristics of BJT

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Fall 2024

Thursday

October 17th, 2022

Background Information:

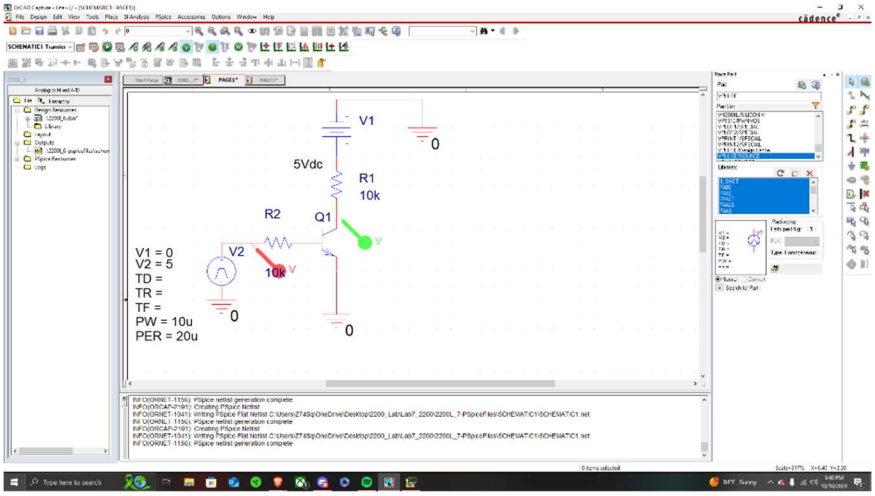
A PNP transistor, a type of BJT, is a semiconductor device used in various applications. One of its primary functions is to amplify AC signals. To ensure stable performance, the BJT must be properly biased, minimizing dependence on variations in β.

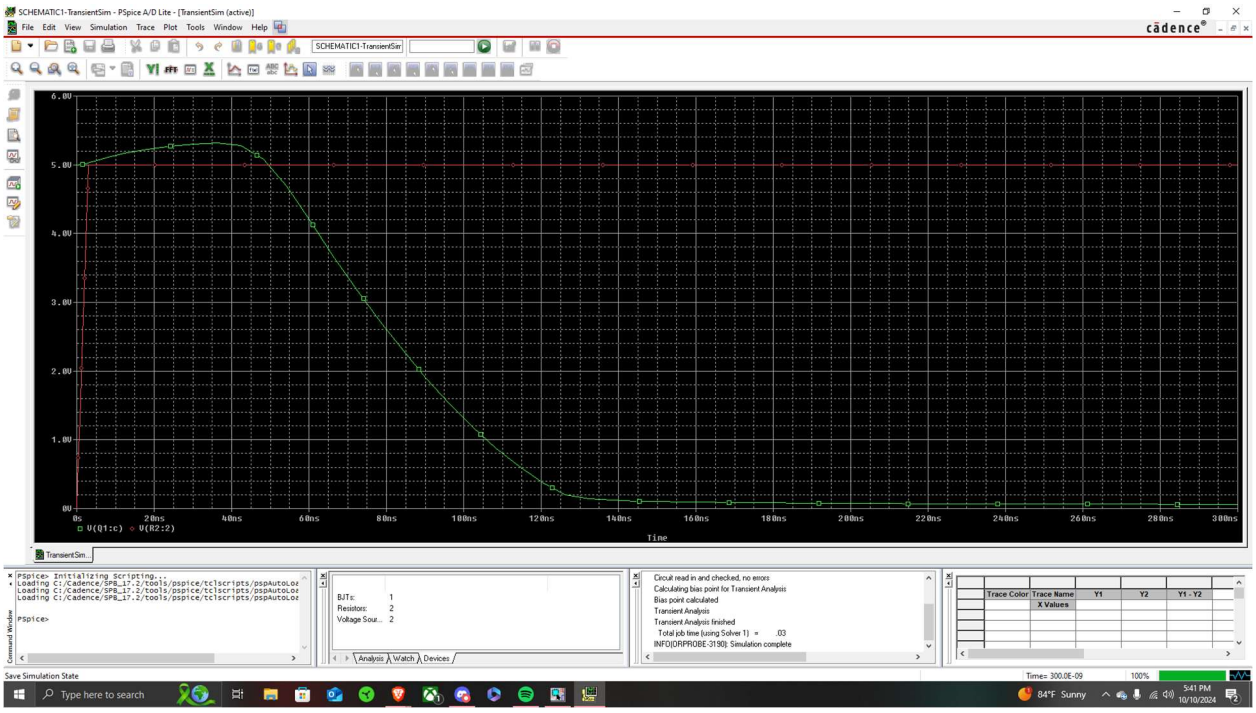
Objective:

To study the large signal characteristics of the bipolar junction transistor though time domain characteristics.

Pre-Lab:

1) Capture Schematics of Fig 1 in PSpice
2) Set your supply (Vin) from 0V – 5V with a pulse width of 10µsec and a 50kHz repetition rate (as explained in the lecture). Run Transient Simulation to display the input waveform and output waveform at the same time.
3) Record the rise time (t_r), fall time (t_f), time delay in the rise(t_{dr}), and time delay in the fall (t_{df}).





$t_r = 244ns$

$t_f = 213ns$

$t_{dr} = 136ns$

$t_{df} = 122ns$

Lab Report:

1. ***Figure 1:***

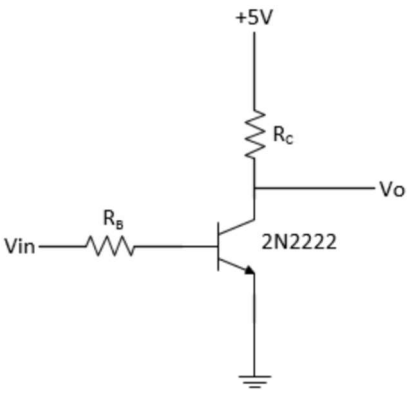
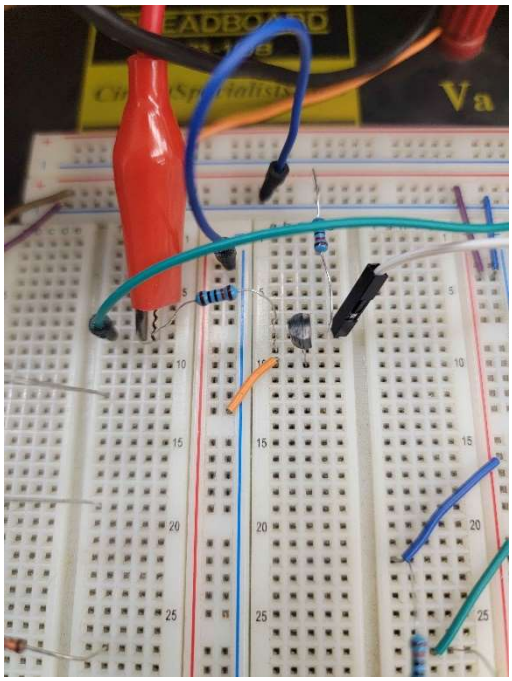
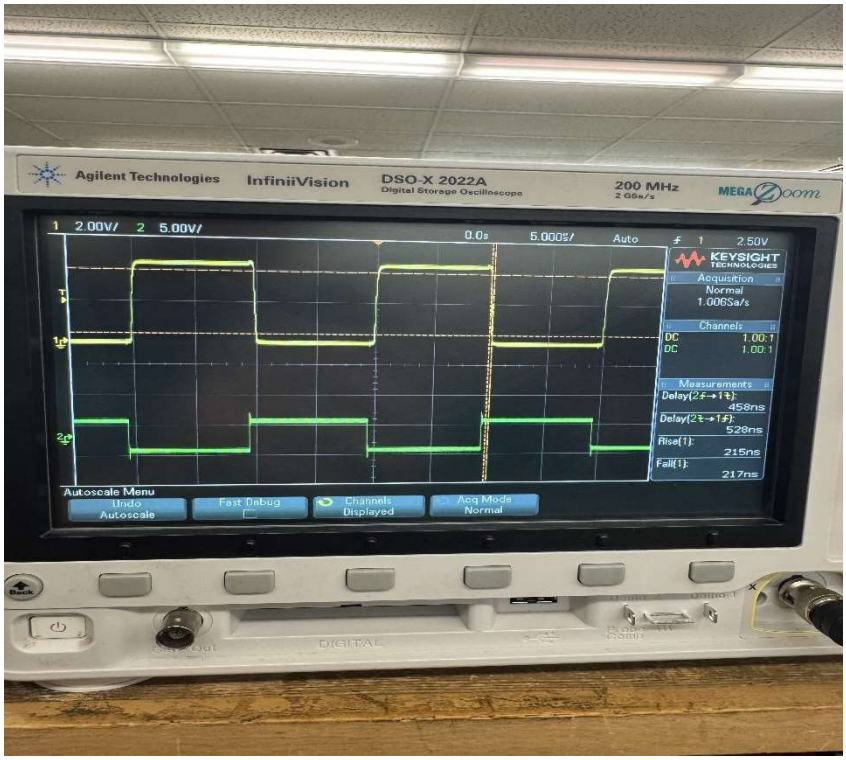


Figure 1

Figure 1 circuit:



Scope Image Representing V_{in} *and* V_{out} *vs time*:



	t_r	t_f	t_{dr}	t_{df}
10k-10k	$2.068\mu s$	$188ns$	$448ns$	$1.192\mu s$
10k-1k	$248ns$	$228n\mu s$	$460ns$	$528ns$
100k-1k	$840ns$	$4.12\mu s$	$4.58\mu s$	$460ns$
100k-10k	2.34μ	$2.02\mu s$	$4.15\mu s$	$1.65\mu s$

Conclusion:

In this experiment, we constructed a circuit and adjusted resistor values to examine the behavior of a BJT. By varying the resistances, we observed how the output and input signals changed over time. Although the overall signal pattern remained consistent, we noted slight variations in the rise and fall times, as well as a shift in the time delay between the input and output signals.