

Feng Chia University

Electrical Engineering Fundamentals II Lab

Laboratory 10

BJT Amplifier Circuits - VTC Measurement

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## I. Introduction

- a. To observe the behavior of BJT amplifier circuits.

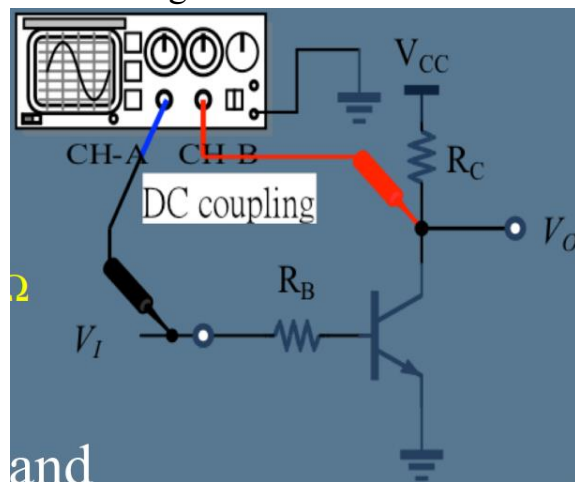
## II. Materials

1. Power supply
2. Function generator
3. Oscilloscope
4. Devices

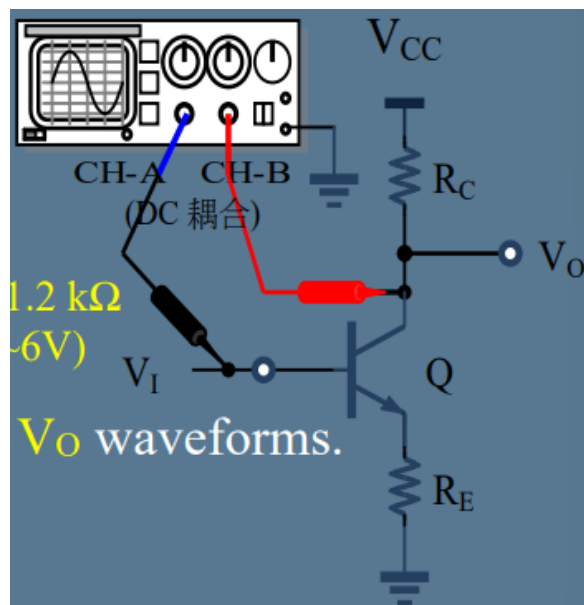
Q: 2SC1815  $\times 1$

Resistors:  $R = 5.6\text{ k}\Omega \times 1, 1.2\text{ k}\Omega \times 1, 33\text{ k}\Omega \times 1, 10\text{ k}\Omega \times 3, 20\text{ k}\Omega \times 3$

## III. Circuit diagram



▲ Figure 1. Circuit of Experiment 10.a Basic BJT Circuits without Emitter Resistor



▲ Figure 2. Circuit of Experiment 10.b Basic BJT Circuits with Emitter Resistor

## IV. Methods

Using Oscilloscope to observe voltage.

## V. Experiments data

### 1. Experiment 10.a Basic BJT Circuits without Emitter Resistor

Table 1: Measurement of BJT without Emitter Resistor

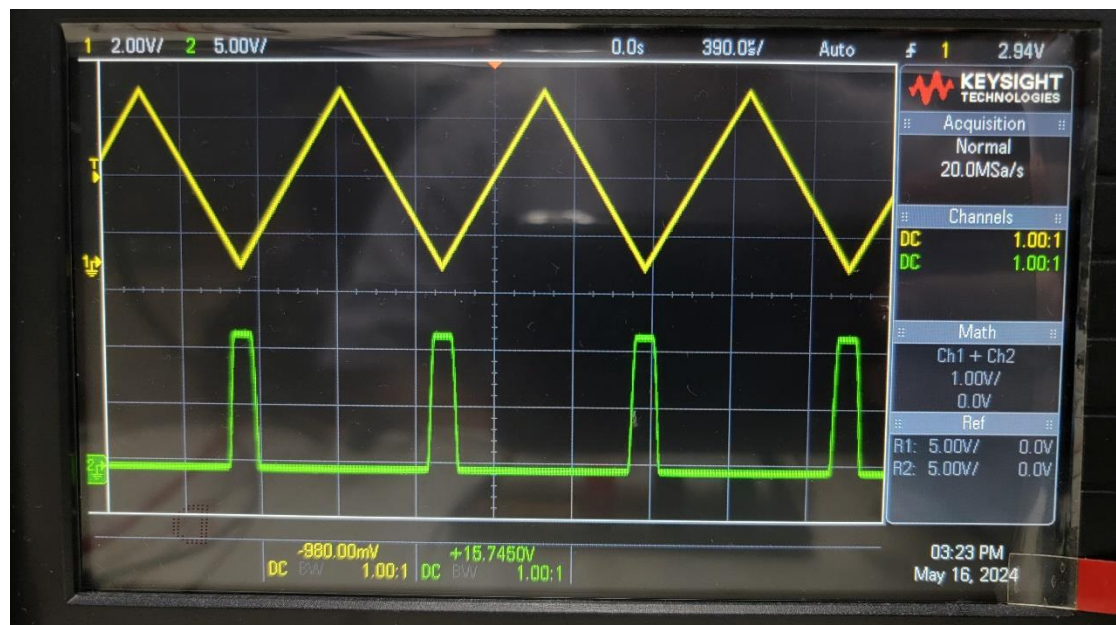
	$V_{IA}$	$V_{IB}$	$V_{OA}$	$V_{OB}$	$A_V$
Measurement	0.4 V	0.9 V	12 V	0 V	24.0000
Theoretical	0.7 V	0.945 V	12 V	0.3 V	47.7551

### 2. Experiment 10.b Basic BJT Circuits with Emitter Resistor

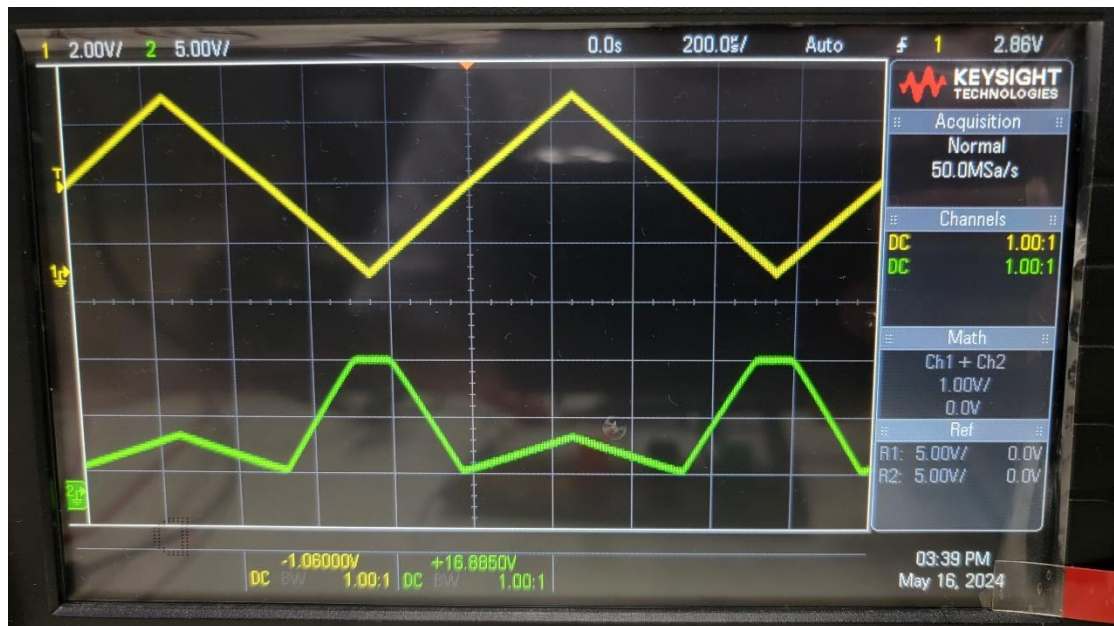
Table 2: Measurement of BJT with Emitter Resistor

	$V_{IA}$	$V_{IB}$	$V_{OA}$	$V_{OB}$	$A_V$
Measurement	0.5 V	2.5 V	12 V	2 V	5.0000
Theoretical	0.7 V	2.9344 V	12 V	2.5344 V	4.2363

## VI. Results



▲ Figure 3. VTC curve of Experiment 10.a



▲ Figure 4. VTC curve of Experiment 10.b

## VII. Discussion

1. Compare the VTC curves from the Experiment 10.a and 10.b (with/without RE) for the differences and the similarities.

Both of them had the peaks in  $V_O$  when  $V_I$  reached valleys. Furthermore, the BJT with emitter resistor had a bent curve. However, BJT without emitter resistor had a smooth curve.

2. Based on the experiment results from 10.a and 10.b, try to derive the conclusions on the effect of RE with following issues:
  - Effect on Voltage gain of linear amplifier region  $A_V$ , and why?  
The Early voltage decreases the transistor's current gain  $\beta$ .  
Lower  $\beta$  due to the Early effect results in reduced voltage gain  $A_V$  in the linear amplifier region.
  - Effect on Switching (ON) region, and why?  
The Early voltage affects base current  $I_B$  and collector current  $I_C$ .  
Higher  $V_{RE}$  values can lead to slower switching times due to reduced  $I_C$

## VIII. Conclusion

From the experimental data above, the BJT work in an ideal situation.