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ET 260 Solid State I

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Exp 24: Swamped CE Amplifier Circuit

Objective

In this experiment, we used a swamping resistor in the emitter to increase the input impedance, and to stabilize the voltage gain against changes in the ac resistance (r 'e )of the circuit. The swamping resistor reduces the voltage gain; thus, it may necessary to cascade two swamped amplifiers to get the same voltage gain as a single un-swamped stage. We will compare both the swamped and the un-swamped amplifier in this experiment.

Procedure

Un-swamped amplifier circuit

Calculation:  
VB = 1.8 V "voltage divider"  
VE =1.8V - 0.7V = 1.1V  
IE = IC = 1.1V / 1kΩ = 1.1 mA

r' be = 26 mV / IC = 26 mV / 1.1mA = 24 Ω  
r' c = 3.9 kΩ / (3.9 kΩ + 1.5 kΩ) = 722Ω  
AV = r' c / r' be = 722Ω / 24Ω = 30

Swamped amplifier circuit

Calculation:  
VB = 1.8 V "voltage divider"  
VE =1.8V - 0.7V = 1.1V  
IE = IC = 1.1V / 1kΩ = 1.1 mA

r' be = 26 mV / IC = 26 mV / 1.1mA = 24 Ω  
r' c = (3.6 kΩ)(51kΩ) / (3.9 kΩ + 1.5 kΩ) . = 3.36 kΩ  
AV = r' c / r' be = 3.36 kΩ / 24Ω + 190Ω = 16

Input impedance Zin Swamped Amplifier



Vin  = 100 mVpp = 62 mV

Vout = Av \* Vin = 16 (62mV) = 1.12V

Conclusion

Having gone through this lab, we learned how to construct the swamping amplifier circuit. As predicted, the voltage gain is reduce almost 50 percent of that un-swamped amplifier circuit. So, we may need to cascade two swamped amplifiers to get the same voltage gain as a single un-swamped stage.