



## CE Amplifier

### Materials:

- [2 Series Mixed Series Oscilloscope \(MSO\)](#)
- Arbitrary/Function Generator (AFG): [AFG1000](#) and Internal AFG on 2 Series
- Direct current (DC) power supply: [2230 High Power Programmable Power Supply](#)
- Digital Multimeter (DMM): [DMM6500](#)
- Resistors (5)
- Capacitors (3)
- BJT
- Breadboard
- Jumper wires

### Procedure:

$R_1 = 100\text{ k}\Omega$

$R_2 = 10\text{ k}\Omega$   
 $C_1 = 10\text{ }\mu\text{F}$

$R_C = 2\text{ k}\Omega$   
 $C_2 = 10\text{ }\mu\text{F}$  BJT pn: 2N2222

$R_E = 1\text{ k}\Omega$

$C_E = 22\text{ }\mu\text{F}$

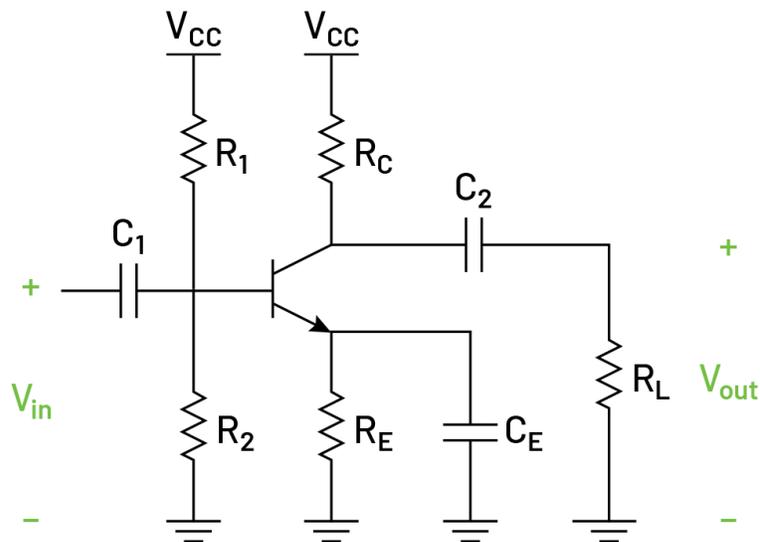


Figure 1. Common-emitter amplifier circuit diagram.

1. Build the CE amplifier circuit in Figure 1. Use either an external AFG or the internal AFG on the 2 Series MSO to supply the input waveform at  $V_{in}$ . There will be supplied 10 V to the  $V_{CC}$  input and a 1 kHz sine wave with an amplitude of 100 mVpp to  $V_{in}$ .
2. Turn on only the power supply and measure the DC voltages at the base, emitter and collector using the DMM6500. Ensure the transistor is in the active region  $V_{BE} \approx 0.7\text{V}$  and  $V_{CE} > V_{BE}$ . Record these measurements in Table 1.



	Voltage (V)
$V_{BE}$	
$V_{CE}$	

Table 1. Bias point measurements.

3. Add the input supply waveform to the  $V_{in}$  input. Connect the channel 1 probe to the input source ( $V_{in}$ ) and the channel 2 probe to output of the amplifier ( $V_{out}$ ) which is across the load resistor  $R_L$ . Turn both channels and the voltage sources on to observe the input and output waveforms of the amplifier. Adjust the horizontal scale to see a few periods of the waveforms and make sure both channels have the same vertical scale for analysis. Observe the waveforms and use the "Measure" button to measure the amplitude of both channels and the phase shift. Use the amplitude values to calculate the gain of the amplifier. Record these values in Table 2.

	Observed Value
Input Amplitude	
Output Amplitdue	
Gain	
Phase	

Table 2. Gain and phase measurements.

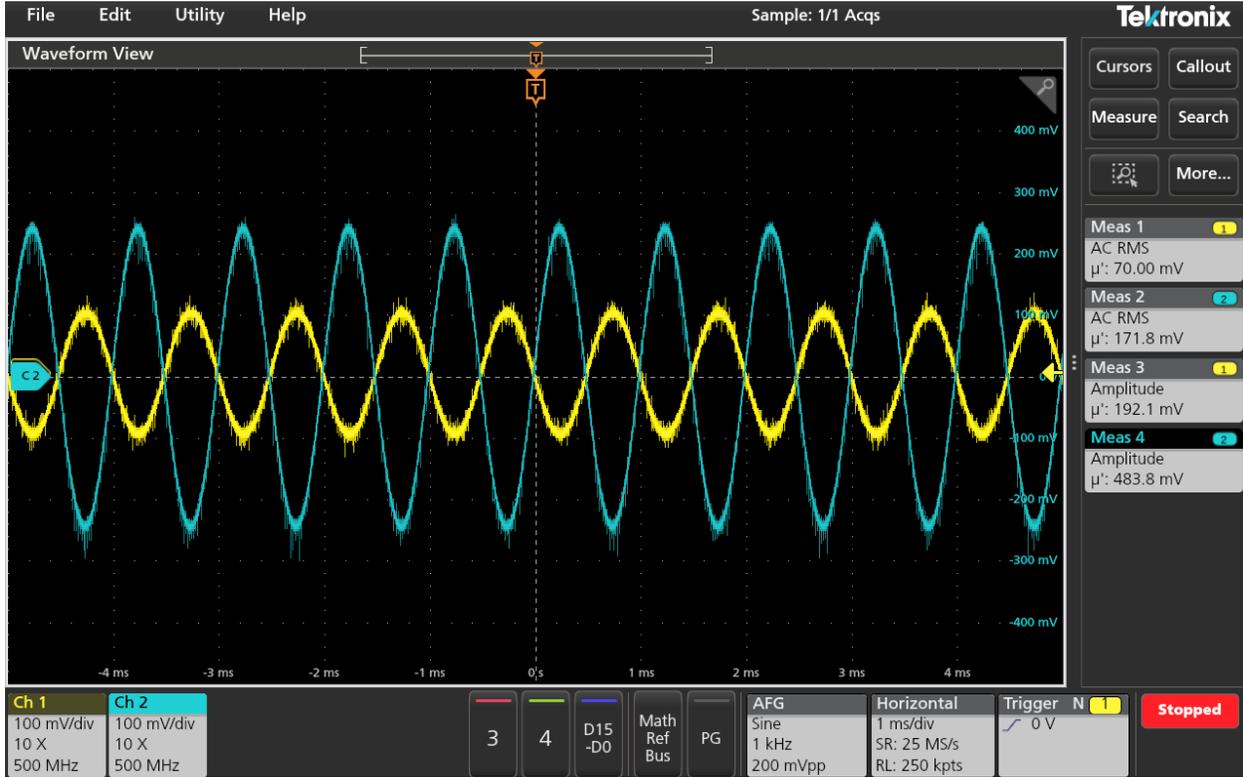
4. Vary the input signal frequency from 100Hz to 1MHz in steps (e.g., 100Hz, 1kHz, 10kHz, 100kHz, 1MHz). Observe the change in the output signal amplitude. Sketch the gain trend over frequency of the amplifier. Estimate and record the bandwidth of the amplifier.

Bandwidth:





Instructor Notes:



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