

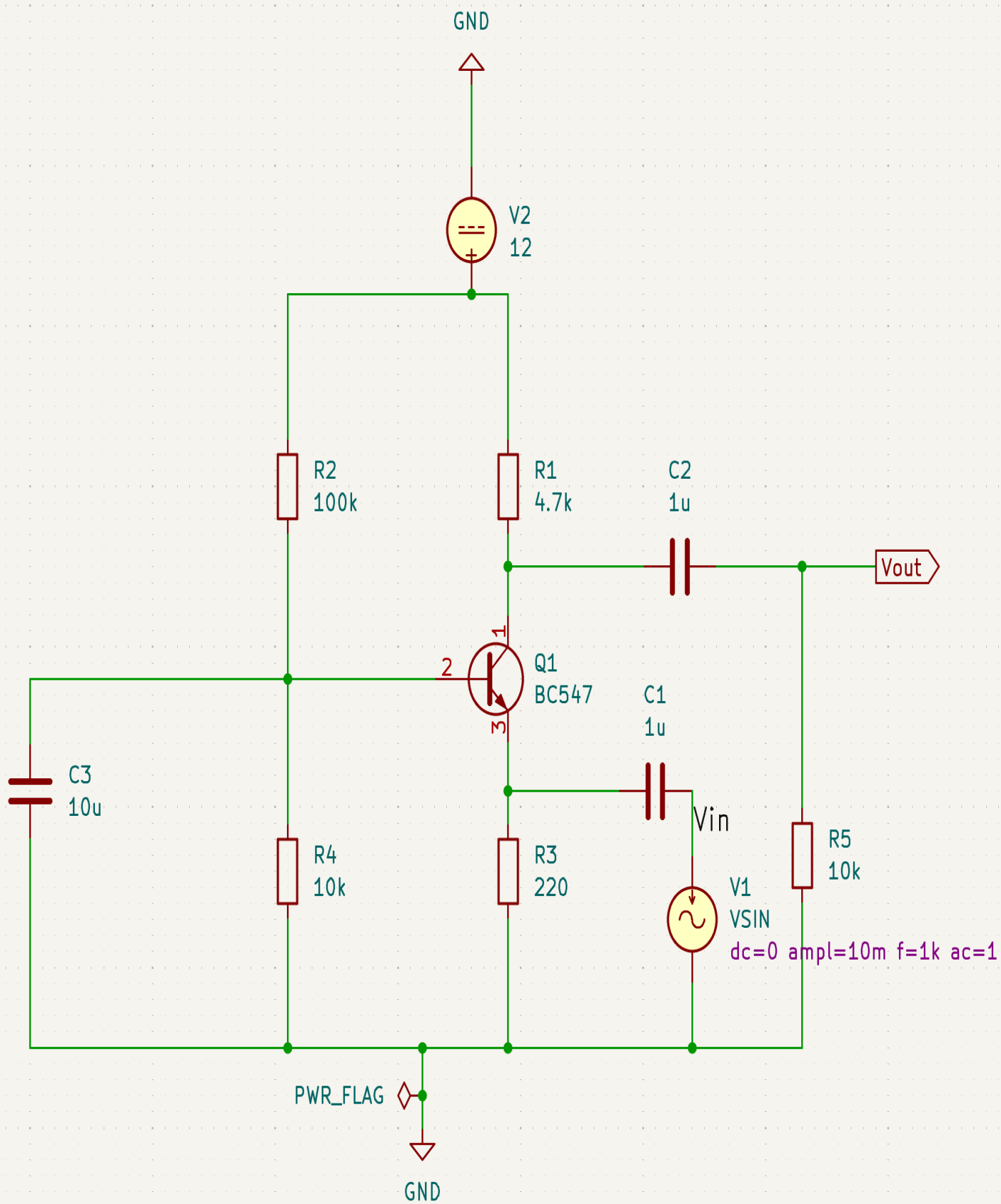
Design Thinking framework

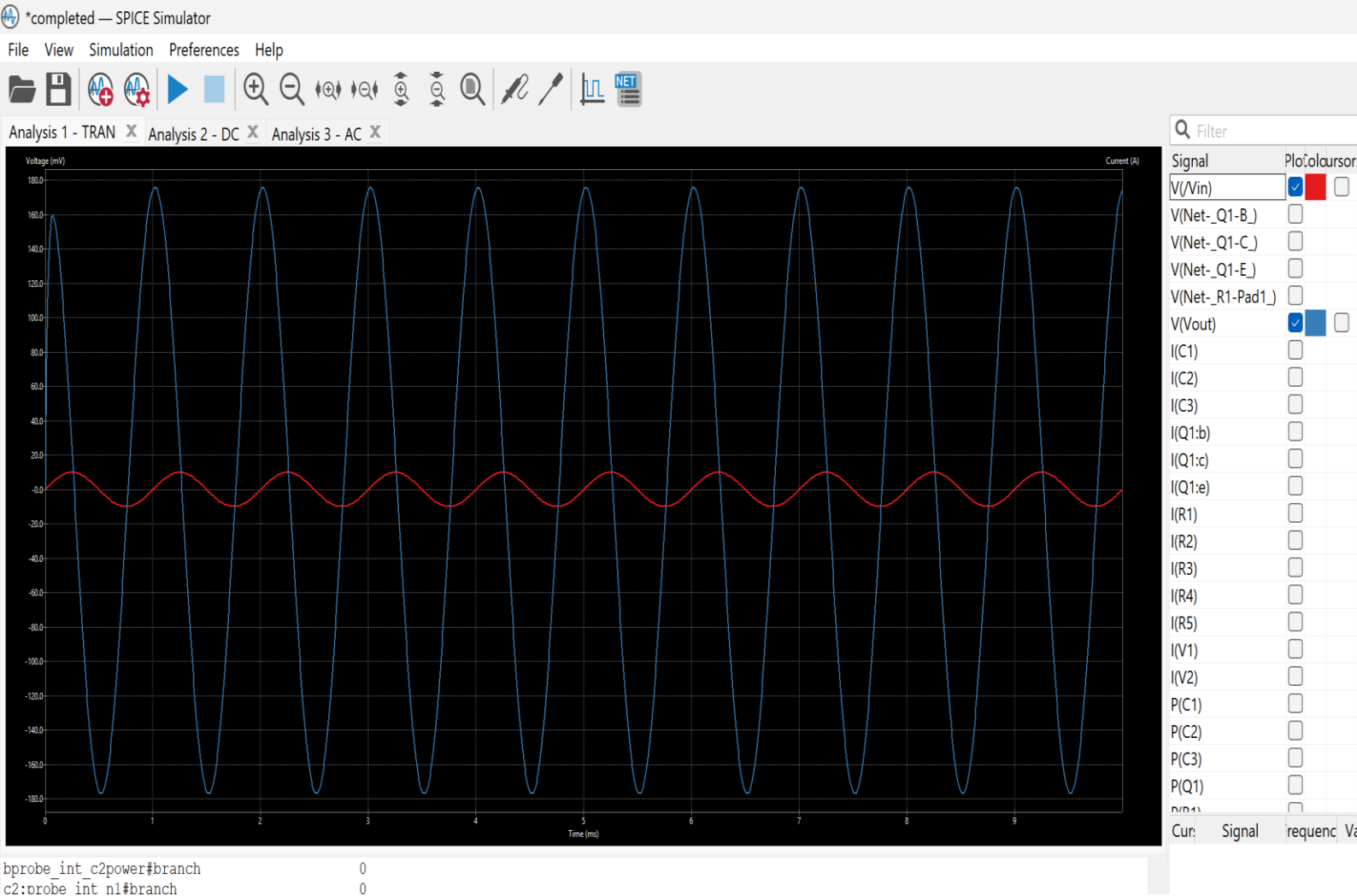
Quantum University

Project- 2

S.no	Learners Name	Name of the Project Statement	Batch number	Project Milestone Submission	GitHub Link
1	Akash Kumar Thakur	observe and analyse the output characteristics of a BJT common base amplifier, and explain the following (i) BJT is called a current controlled current source (ii) CB-BJT can be used as current buffers	2	2st	https://github.com/Shubham-5323/Design-Thinking-Framework-Quantum-University-02-Project
2	Mantasha Ali				
3	Aman Kumar Thakur				
4	Shubham Yadav				

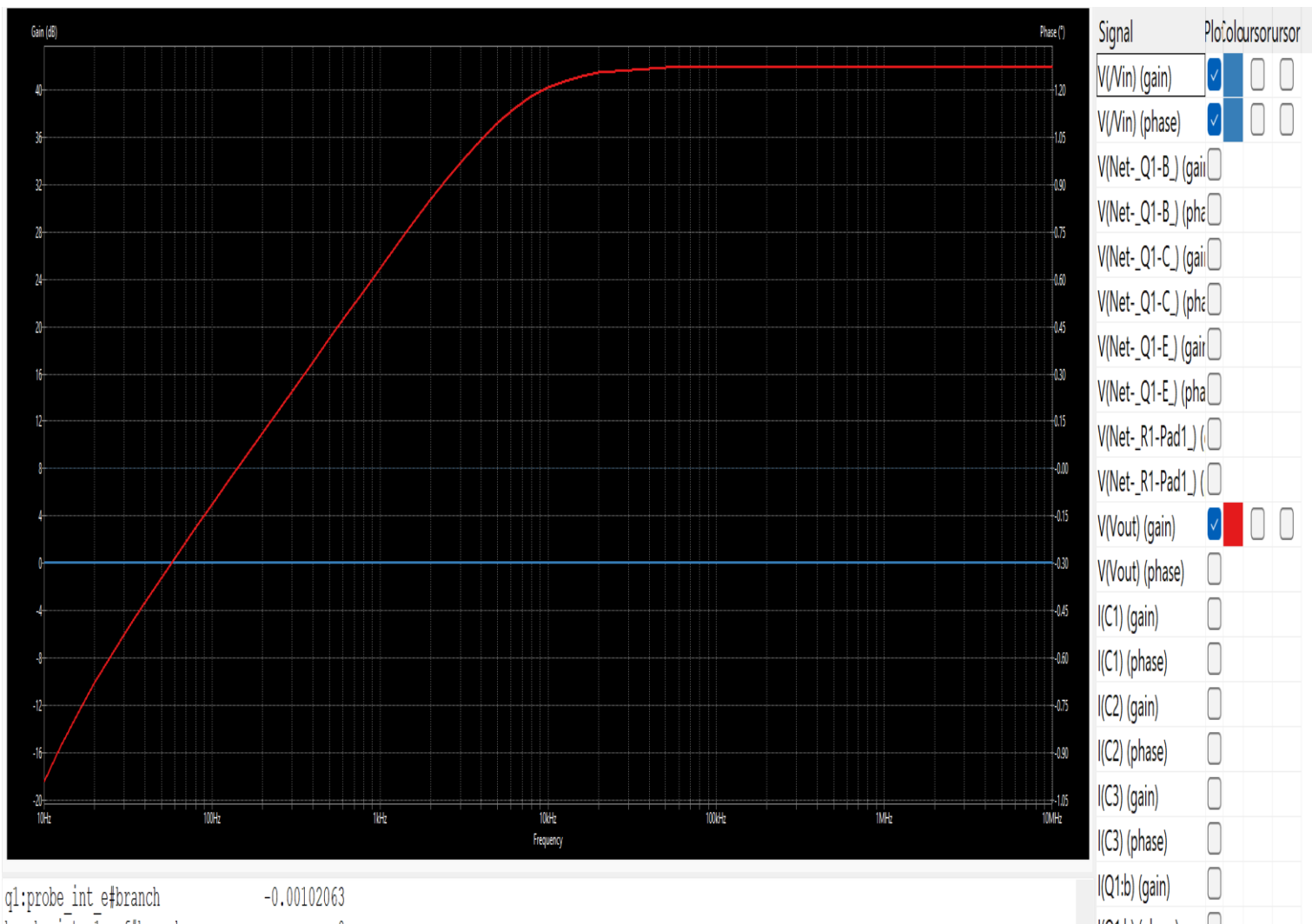
Schematic Diagram





➤ Transient Analysis

- Shows how the amplifier responds to signals that change over time, like pulses or sine waves.
- Helps confirm that the circuit accurately follows the input signal without delay or distortion.
- Demonstrates real-time behaviour, useful for checking signal shape and timing.

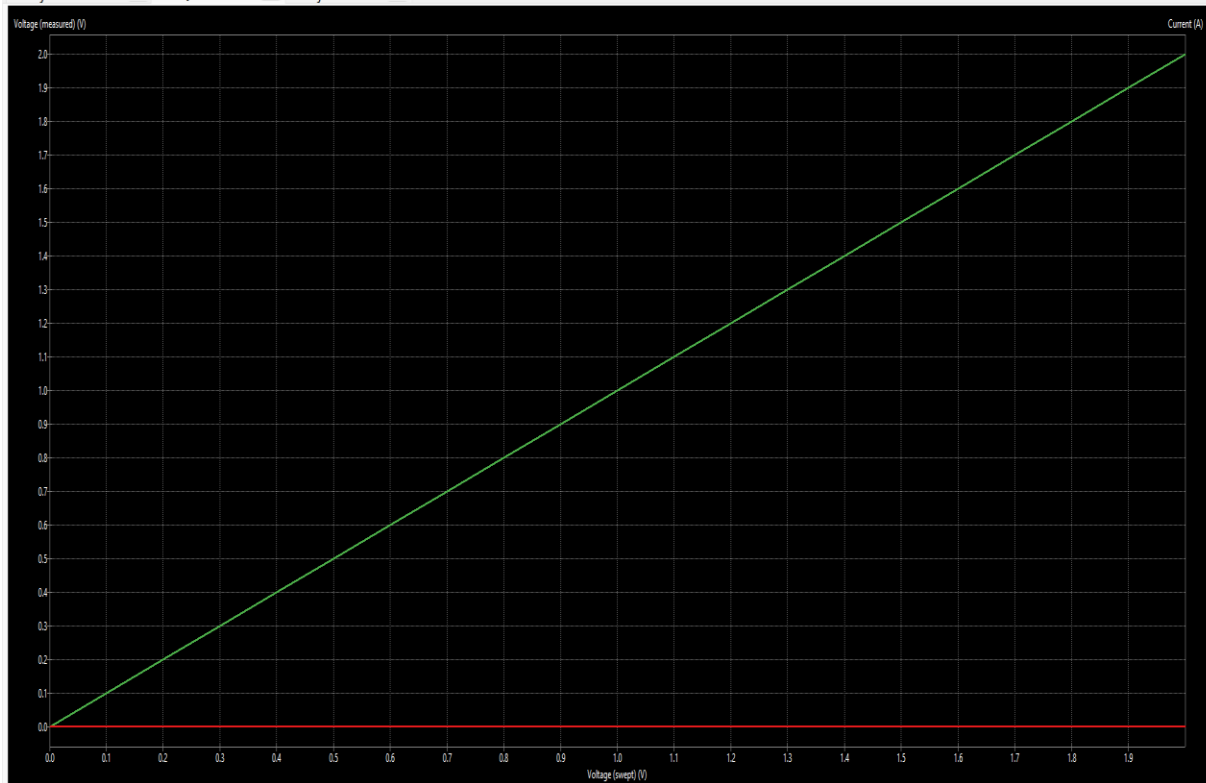


➤ AC Analysis (Frequency Response)

- Examines how the circuit responds to small input signals across a range of frequencies.
- Determines the amplifier's ability to amplify or transfer signals without loss across those frequencies.
- Confirms if the circuit behaves as a buffer or amplifier and helps identify useful frequency ranges (bandwidth)



Analysis 1 - TRAN X Analysis 2 - DC X Analysis 3 - AC X



q1:probe_int_e#branch -0.00102063
bprobe_int_q1vref#branch 0

Signal	Plot	Cursor
V(Vin)	<input checked="" type="checkbox"/>	<input type="checkbox"/>
V(Net-Q1-B_)	<input type="checkbox"/>	<input type="checkbox"/>
V(Net-Q1-C_)	<input type="checkbox"/>	<input type="checkbox"/>
V(Net-Q1-E_)	<input type="checkbox"/>	<input type="checkbox"/>
V(Net-R1-Pad1_)	<input type="checkbox"/>	<input type="checkbox"/>
V(Vout)	<input checked="" type="checkbox"/>	<input type="checkbox"/>
I(C1)	<input type="checkbox"/>	<input type="checkbox"/>
I(C2)	<input type="checkbox"/>	<input type="checkbox"/>
I(C3)	<input type="checkbox"/>	<input type="checkbox"/>
I(Q1:b)	<input type="checkbox"/>	<input type="checkbox"/>
I(Q1:c)	<input type="checkbox"/>	<input type="checkbox"/>
I(Q1:e)	<input type="checkbox"/>	<input type="checkbox"/>
I(R1)	<input type="checkbox"/>	<input type="checkbox"/>
I(R2)	<input type="checkbox"/>	<input type="checkbox"/>
I(R3)	<input type="checkbox"/>	<input type="checkbox"/>
I(R4)	<input type="checkbox"/>	<input type="checkbox"/>
I(R5)	<input type="checkbox"/>	<input type="checkbox"/>
I(V1)	<input type="checkbox"/>	<input type="checkbox"/>
I(V2)	<input type="checkbox"/>	<input type="checkbox"/>
P(C1)	<input type="checkbox"/>	<input type="checkbox"/>
P(C2)	<input type="checkbox"/>	<input type="checkbox"/>
P(C3)	<input type="checkbox"/>	<input type="checkbox"/>
P(Q1)	<input type="checkbox"/>	<input type="checkbox"/>
P(R1)	<input type="checkbox"/>	<input type="checkbox"/>

➤ DC Sweep Analysis (Static Output Behaviour)

- Reveals how the output current changes as the voltage across the output is varied, for different fixed input current levels.
- Shows that the output current mainly depends on the input current and is nearly unaffected by output voltage.
- Confirms the transistor acts like a current source controlled by another.

Explain the following

- (i) BJT is called a current controlled current source
- (ii) CB-BJT can be used as current buffers

(I) BJT is called a current-controlled current source (CCCS)

- A **Bipolar Junction Transistor (BJT)** operates based on current control. The input current at the **base** controls the output current at the **collector**.
- The relationship follows **collector current (I_c) = $\beta \times$ base current (I_b)**, where β is the current gain.
- Since the base current influences the collector current proportionally, a BJT functions as a **current-controlled current source**, meaning a small input current can regulate a larger output current.

(ii) Common-Base BJT (CB-BJT) as a Current Buffer

- A **CB configuration** provides a **low input impedance** and **high output impedance**, making it useful for current buffering.
- It ensures that the input current is transferred almost completely to the output with minimal variation.
- The **current gain (α)** in CB mode is close to **1**, meaning the output current closely follows the input current, reinforcing its use as a **current buffer** to prevent loading effects in circuits.