دارات الكترونية
المحاضرة /8/ ـ عملي

الدكتور السموءل صالح
المهندس جبران خليل
**المهندسة ايه خيربك**

Operating point of a transistor

A transistor intended for use in a signal amplification circuit needs to be biased1 . This prevents the AC signal from lowering the base-emitter voltage beyond the gate threshold. The amplified signal is decoupled from the amplifier in order to offset the AC component required for biasing.

The transistor is biased using a direct voltage which is coupled with the alternating voltage via capacitors.

The amplified signal is isolated from the DC component using a capacitor.

Operating point of a transistor
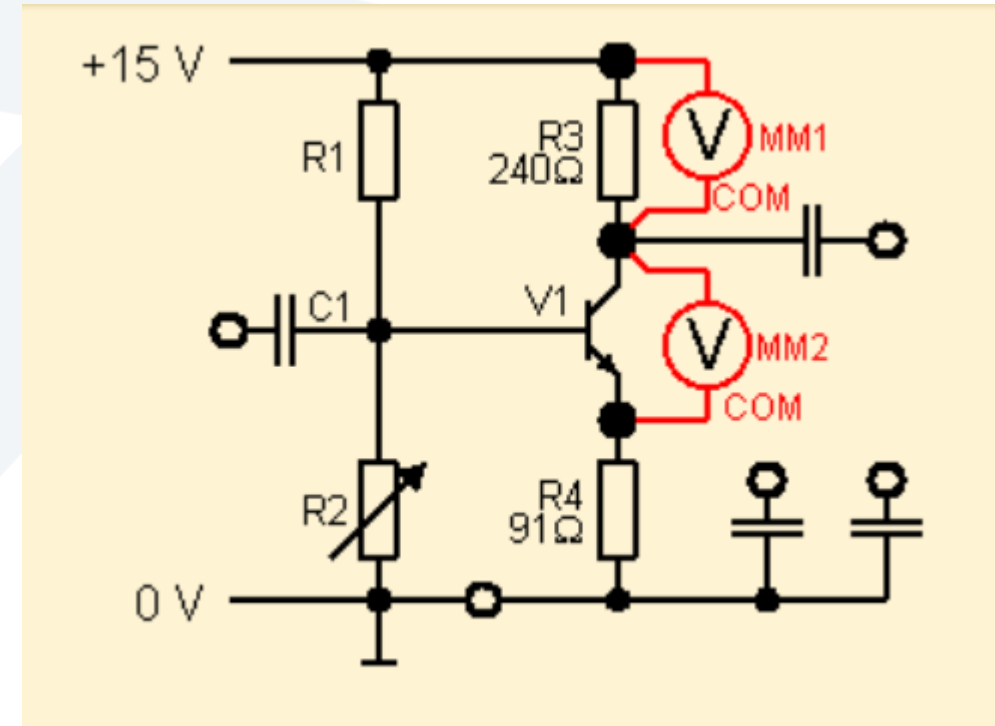
Circuit configuration
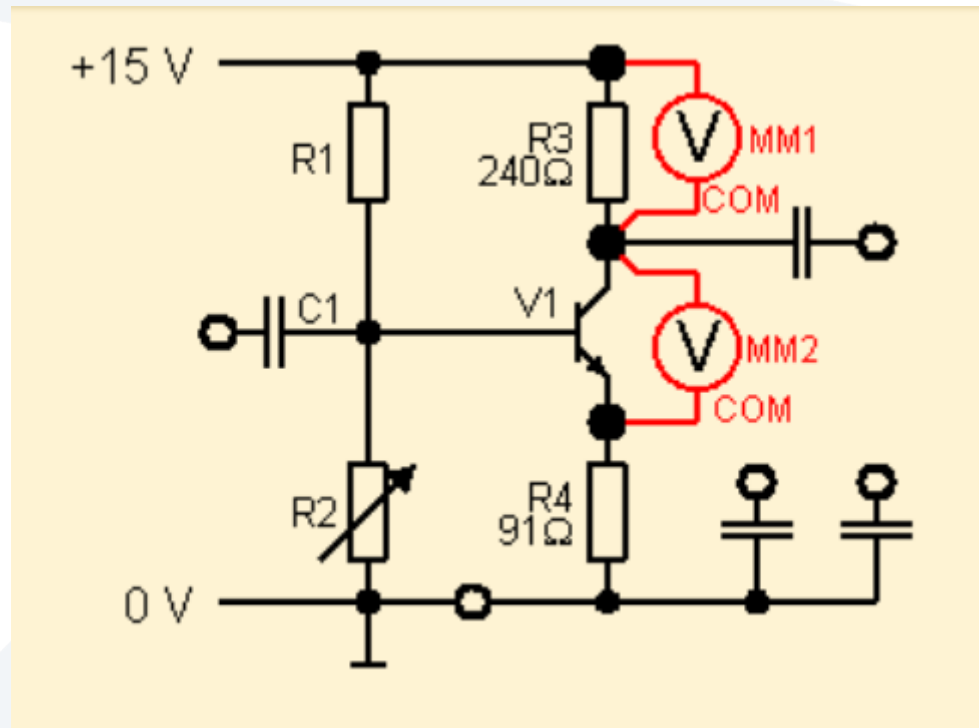
Operating point of a transistor

Circuit configuration:

he operating point is determined with the voltage divider consisting of R1 and R2.

For this purpose, measure UCE and IC . R3 is used as a current-sensing resistor here
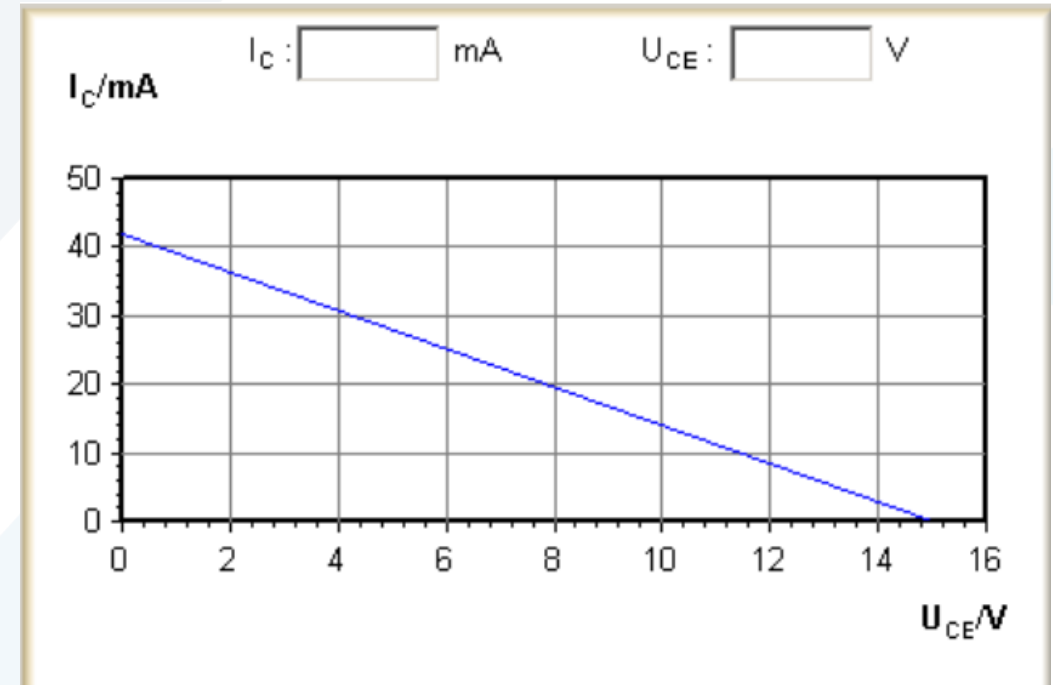
Operating point of a transistor

Operating point:

Changing R2 also changes ICE and UCE, thus shifting the operating point.

The operating point moves along a slope representing resistors R3 and R4 in the output characteristic quadrant.

Negative current feedback through R4 prevents a rise in temperature from shifting the selected operating point.

The effect of the current feedback is described in the chapter titled "Power dissipation of a transistor

Operating point of a transistor

Summary :

- At the operating point, the alternating current is prevented from lowering the base-emitter voltage beyond the forward threshold.
- The operating point is located on the slope of the collector and/or emitter resistance in the output characteristic quadrant.
- To prevent a rise in temperature from shifting the operating point, this point is stabilized by the emitter resistance.

Transistor in a common emitter circuit

Transistor in a common emitter circuit

Basic transistor circuits can be divided into three different categories:
• Emitter amplifier
• Base amplifier
• Collector amplifier

These basic circuits differ in terms of the transistor terminal which is grounded with respect to the AC signal.
 In the case of the emitter amplifier, the emitter is grounded.
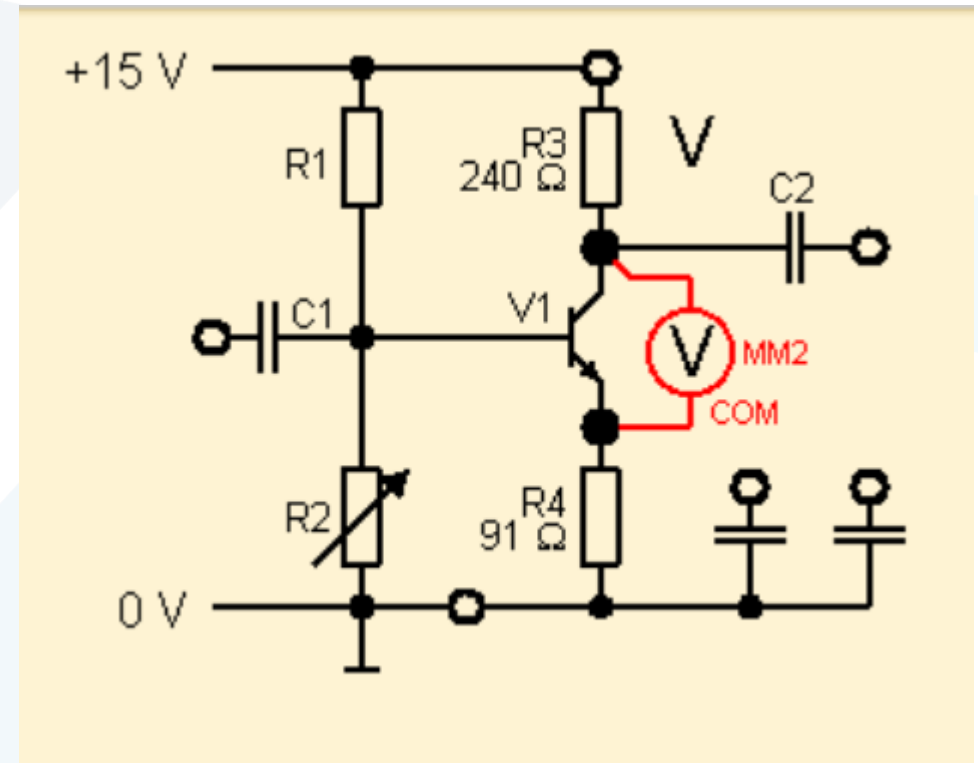
Transistor in a common emitter circuit

Setting the operating point :

The operating point is set as described before.
The collector-emitter voltage is tapped directly at the corresponding transistor terminals.

This voltage is set to +7,5 V with potentiometer R2.

The potentiometer setting must NOT be altered during the following experiments.
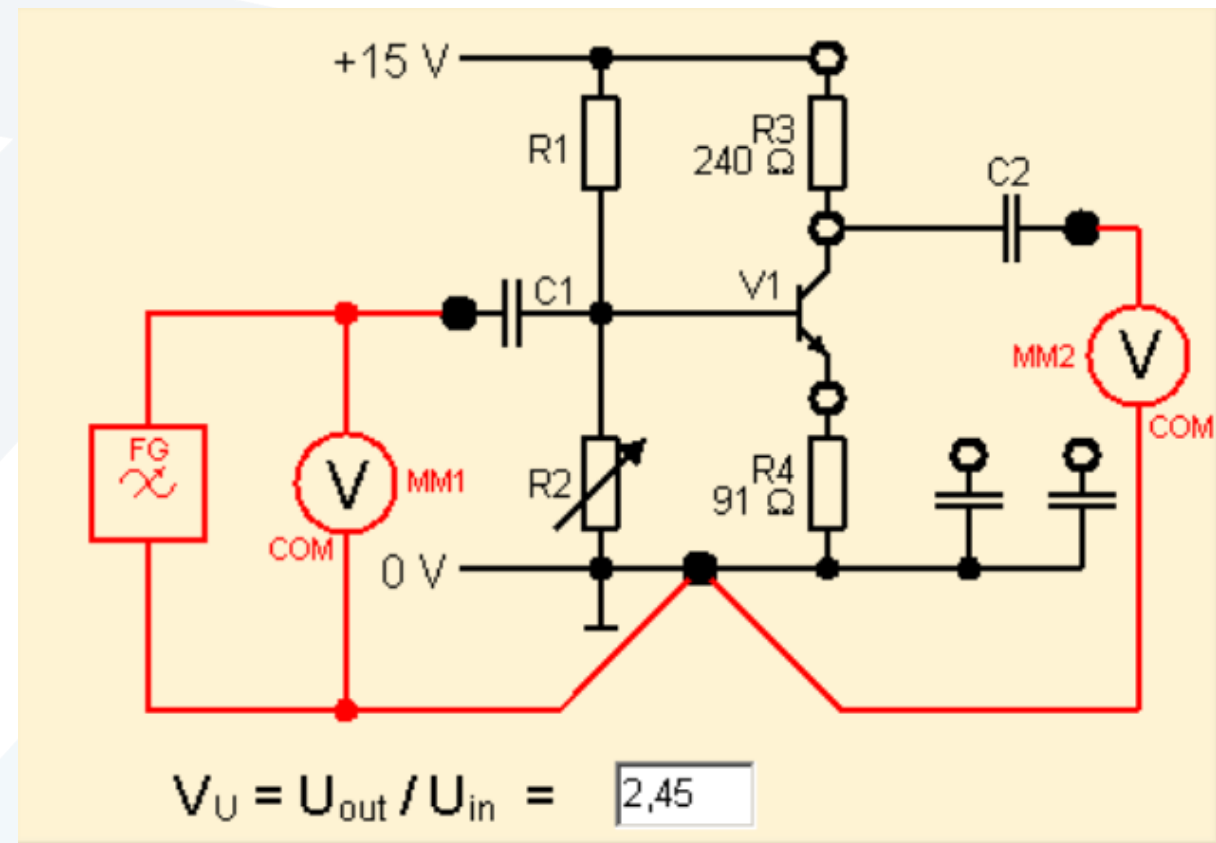
Transistor in a common emitter circuit

Voltage gain :

The alternating voltage is coupled via C1 and decoupled via C2. The input voltage is measured before C1, the output voltage is measured after C2.

VU = Uout / Uin

$$V_U = U_{out} / U_{in} = \boxed{2{,}45}$$

Transistor in a common emitter circuit

Current gain :

The input current1 is measured before C1. The output current corresponds to the collector current2

.

This current is determined using R3 as a current-sensing resistor.

VI = IOUT /IN

As P = U • I, the power amplification is calculated as follows:

Vp = VU • VI

Input current IN, measured in mA

Collector current in A: IC = UR3 / R3

Collector current in mA: IOUT = UR3 / R3 • 1000

$$V_I = I_{out} / I_{in} = \boxed{6{,}86}$$