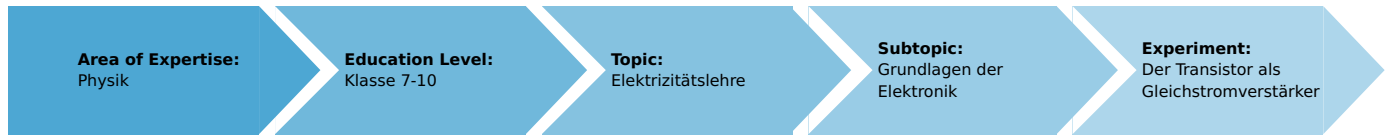


The transistor as a direct current amplifier (Item No.: P1374300)

Curricular Relevance



Difficulty



Intermediate

Preparation Time



10 Minutes

Execution Time



10 Minutes

Recommended Group Size



2 Students

Additional Requirements:

Experiment Variations:

Keywords:

Task and equipment

Information for teachers

Additional information

In a transistor, a small change in the base current causes a large change in the collector current. In this experiment, the relationship between the collector current and the base current is examined, and the control characteristic graph plotted. The current amplification factor of the transistor can be determined from the slope of the characteristic curve.

Notes on setup and procedure

Take care that the maximum power dissipation of the transistors $P_D = 600 \text{ mW}$ is not exceeded. This is ensured when the collector current is kept below 30 mA.

Remarks

The values of the current amplification factor are very dependent on the individual transistor. Transistors are therefore separated into current amplification factor groups. In the case of the current amplification factor group 40 of the transistor used, the value for β for the individual transistors lies within the range of 265 to 600. You might therefore find it necessary to select a different measurement range for the measurement of the base current with the transistor you use.

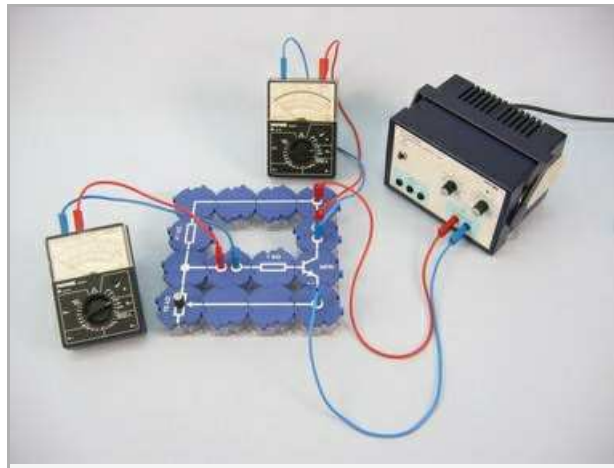
The transistor as a direct current amplifier (Item No.: P1374300)

Task and equipment

Task

Can a transistor be used as an amplifier?

Examine the dependence of the collector current of an npn transistor on the base current at a constant collector voltage of 12 V.



Equipment



Position No.	Material	Order No.	Quantity
1	Straight connector module, SB	05601-01	4
2	Angled connector module, SB	05601-02	1
3	T-shaped connector module, SB	05601-03	1
4	Interrupted connector module, SB	05601-04	2
5	Angled connector module with socket, SB	05601-12	2
6	Resistor module 47 kOhm, SB	05615-47	1
7	Resistor module 1 kOhm, SB	05614-10	1
8	Potentiometer module 10 kOhm, SB	05625-10	1
9	NPN transistor module BC337, SB	05656-00	1
10	Connecting cord, 32 A, 250 mm, red	07360-01	1
11	Connecting cord, 32 A, 250 mm, blue	07360-04	1
12	Connecting cord, 32 A, 500 mm, red	07361-01	2
13	Connecting cord, 32 A, 500 mm, blue	07361-04	2
14	PHYWE power supply DC: 0...12 V, 2 A / AC: 6 V, 12 V, 5 A	13505-93	1
15	Multi-range meter, analogue	07028-01	2

Set-up and procedure

Set-up

Set up the circuit as shown in Fig. 1 and Fig. 2, ensure that the measurement ranges and polarity of the measuring instruments are correctly chosen (measurement range 50 μA for the base current, 30 mA for the collector current).

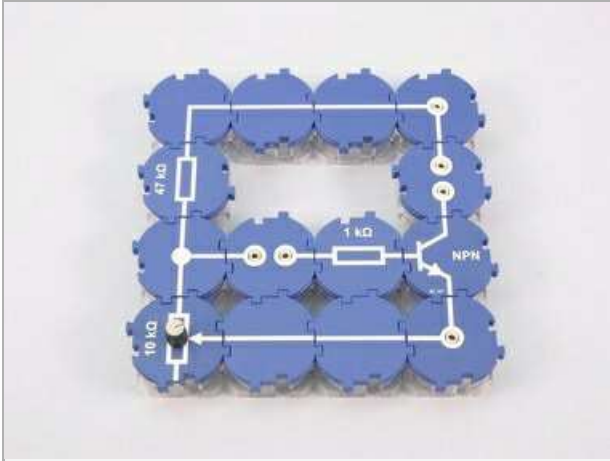


Fig. 1

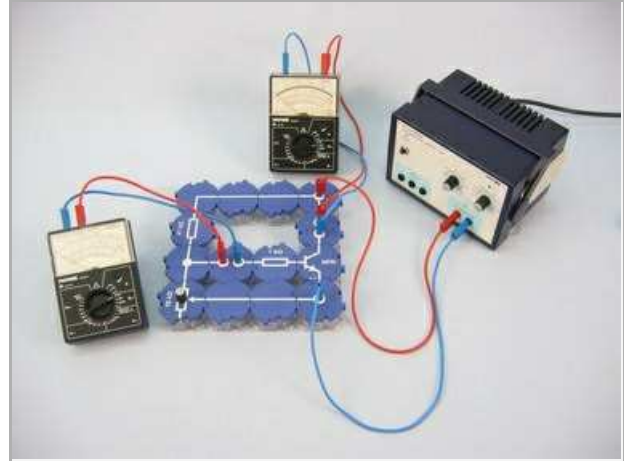


Fig. 2

Procedure

- Turn the potentiometer to the right stop.
- Switch on the power supply; set the voltage on the power supply to 12 V–.
- Use the potentiometer to increase the base current in steps of 10 μA , wait until the base current is constant (correct if necessary) and enter the values for the collector current in Table 1 in the report.
- Switch off the power supply.

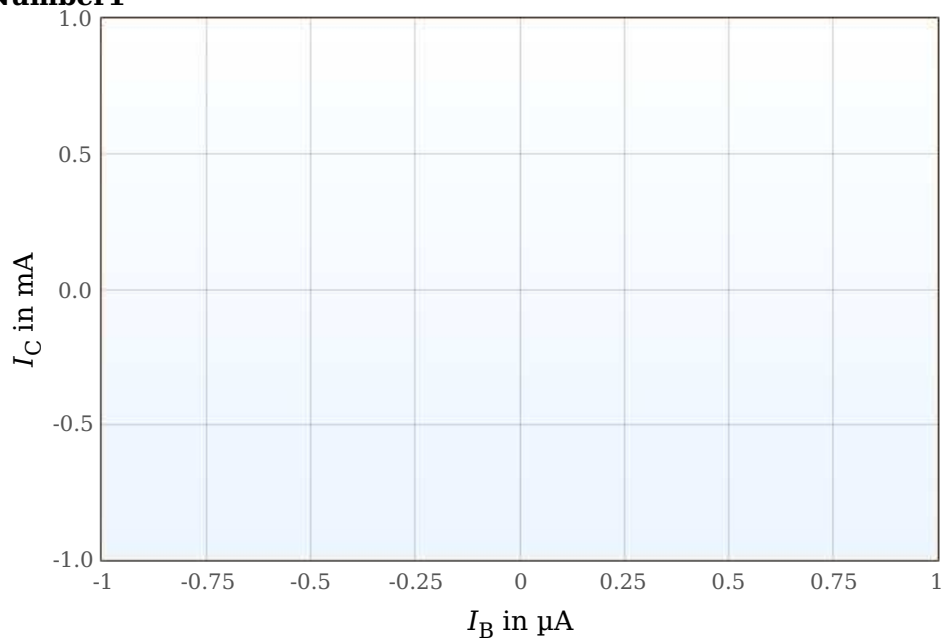
Report: The transistor as a direct current amplifier

Result - Table 1

Record your measured values in the table.

I_B in μA	I_C in mA
	1 ± 0
	1 ± 0
	1 ± 0
	1 ± 0
	1 ± 0
	1 ± 0

Number1



Evaluation - Question 1

What size is the change in the collector current when the base current is increased by 10 μA ?

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.....

.....

.....

Evaluation - Question 2

The ratio of the change in the collector current to the change in the base current is called the current amplification factor $\beta = \Delta I_C / \Delta I_B$, or the current gain, of the transistor. Determine the value of the current amplification factor for the transistor examined. Take the different units for the two currents into account.

$\beta =$