Electronics with the Modular System

Basic Electronic Circuits

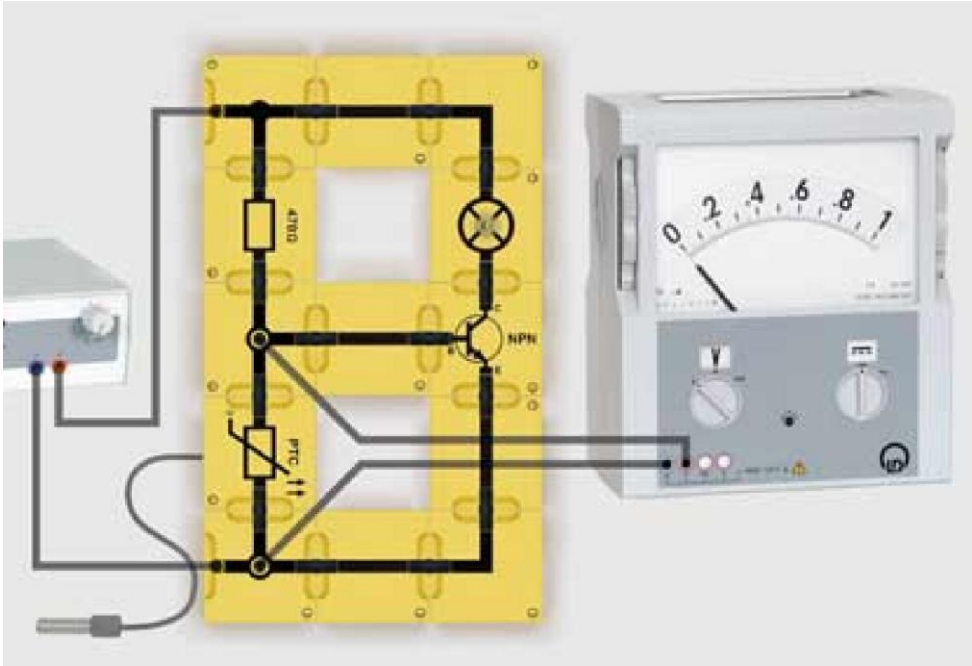
Transistor Applications

Temperature-controlled transistor

Objective of the experiment

To demonstrate the working principle of a temperature-controlled transistor.

Setup



Apparatus

1		539 043	Transistor NPN, BD 137, BST
1		539 022	PTC probe 30 Ω, BST
1		539 010	Resistor 470 Ω, BST
1		539 024	Lamp socket E10, BST
1	from	505 15	Incandescent lamp, 6 V, 0.05 A, E10
4		539 001	Connector blocks BST, straight
2		539 004	Connector blocks BST, 90° angle
1		539 006	Connector block BST, T branch
2		539 007	Connector blocks BST, T branch with socket
14		539 000	Bridging plug, BST
1		531 906	Demo multimeter, passive
1		521 49	Power supply, 12 V DC, 230 V
4		500 644	Safety connection lead, 100 cm
1		301 300	Demonstration experiment frame
1		301 301	Adhesive magnetic board
additionally required			
1			Lighter

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Carrying out the experiment

- Adjust a voltage of approx. 6 V at the power supply.
- Observe the incandescent lamp at room temperature and read the voltage U_{BE} on the demo multimeter.
- Heat the PTC probe with a lighter.
- Observe the incandescent lamp again and read the voltage U_{BE} on the demo multimeter.

Observation and measuring example

PTC	U_{BE} / V	Lamp lit up
At room temperature	0.4	no
After heating with lighter	>0.7	yes

Evaluation

The resistance R of a PTC increases when heated (see Experiment D 4.1.1.1.b Temperature-dependent resistors).

The base-emitter voltage U_{BE} depends on the resistance R of the PTC. For low resistances R, the base-emitter voltage U_{BE} is below the threshold voltage U_S = 0.6 V. No collector current I_C flows. The lamp doesn't light up.

For very high resistances R the base-emitter voltage U_{BE} is above the threshold voltage U_S. A collector current I_C flows. The lamp lights up.

Based on the principle of the investigated circuit, a temperature-monitoring device can be built (e.g. for fire-prone rooms).

If the temperature exceeds the threshold value, an alarm system is activated.