

Electronics with the Modular System

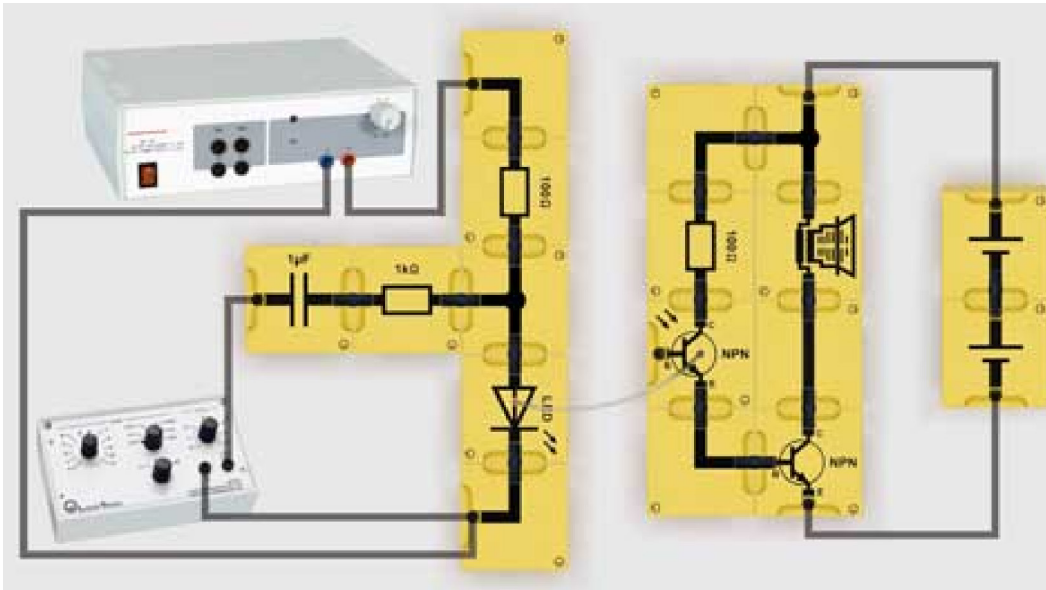
Basic Electronic Circuits
Transistor Applications

Signal transmission with a
light waveguide – Setup
with single-stage transistor
amplifier

Objective of the experiment

To demonstrate the signal transmission between an LED and phototransistor through a light waveguide.

Setup



Apparatus

1	539 047	Phototransistor LWL, NPN, BST
1	539 043	Transistor NPN, BD 137, BST
1	539 040	Light-emitting diode LWL, BST
1	579 44	Light waveguide, 2 pieces
2	539 009	Resistors 100 Ω, BST
1	539 011	Resistor 1 kΩ, BST
1	539 031	Capacitor 1 μF, BST
1	539 049	Loudspeaker, BST
2	539 053	Battery elements, BST
1	539 001	Connector block BST, straight
4	539 004	Connector blocks BST, 90° angle
2	539 006	Connector blocks BST, T branch
14	539 000	Bridging plug, BST
1	521 49	Power supply, 12 V DC, 230 V
1	522 621	Function generator S 12
6	500 644	Safety connection lead, 100 cm
1	301 300	Demonstration experiment frame
1	301 301	Adhesive magnetic board

Carrying out the experiment

- Set up the circuit.
- Adjust a voltage of approx. 3 V at the power supply. Adjust the function generator to a sine wave of approx. 1 kHz and maximum amplitude.
- Observe the light-emitting diode.
- Insert one end of the optical fibre into the LED opening and observe the other end of the optical fibre.
- After that, insert the free end of the optical fibre into the phototransistor opening and pay attention to the acoustic signal of the loudspeaker.
- Remove the optical fibre from the phototransistor opening and pay attention to the signal.

Observation

The red light emitted by the LED propagates in the light waveguide.

After inserting the optical fibre into the phototransistor, an acoustic signal is emitted by the loudspeaker.

When the optical fibre is removed from the phototransistor opening, an acoustic signal is no longer.

Evaluation

The light intensity of the LED varies with the frequency of the injected AC voltage.

These intensity variations are transmitted to the base of the phototransistor through the optical fibre.

As a result, a variable collector current I_C flows which is amplified by the NPN transistor and can be detected with the aid of a loudspeaker.