

# Electronics with the Modular System

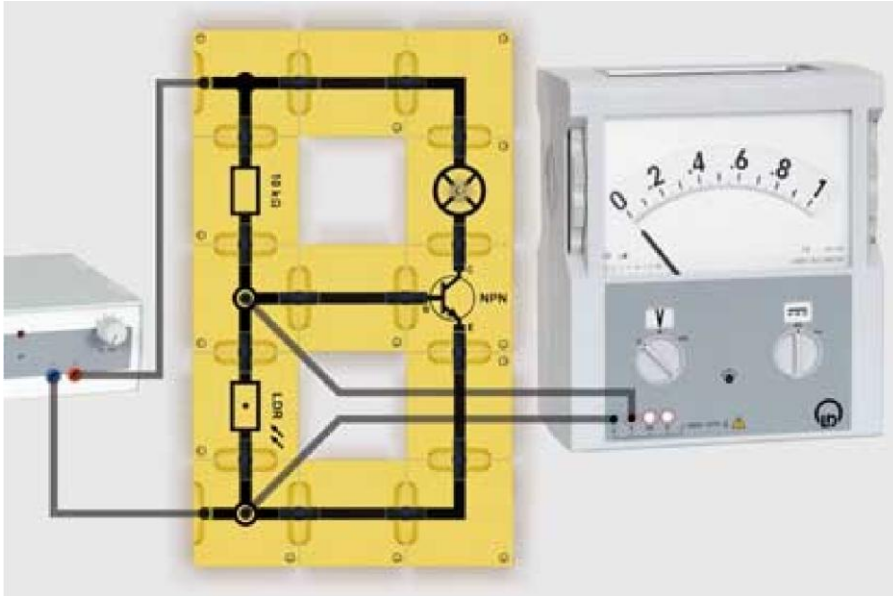
## Twilight switch

Basic Electronic Circuits  
Transistor Applications

### Objective of the experiment

To demonstrate the working principle of a twilight switch.

### Setup



### Apparatus

1	539 043	Transistor NPN, BD 137, BST
1	539 020	Photoresistor LDR 05, BST
1	from 539 013	Resistor 10 kΩ, BST
1	539 024	Lamp socket E10, BST
1	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		Strip of cardboard

**Carrying out the experiment**

- Adjust a voltage of approx. 6 V at the power supply.
- Initially, expose the LDR to daylight.
- Observe the incandescent lamp and read the voltage  $U_{BE}$  on the demo multimeter.
- Darken the LDR with a strip of cardboard.
- Observe the incandescent lamp again and read the voltage  $U_{BE}$  on the demo multimeter.

**Observation and measuring example**

LDR	$U_{BE}$ in V	Lamp lit up
In the light	0.2	no
In darkness	0.7	yes

**Evaluation**

The resistance  $R$  of an LDR is very low in the light, but very high in the dark (see Experiment D 4.1.1.3.a Light-dependent resistor LDR).

The base-emitter voltage  $U_{BE}$  depends on the resistance  $R$  of the LDR. 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 twilight switch can be built (e.g. for street lighting).

The street lighting automatically switches on or off according to the light intensity.