

### INTRODUCTION TO TRANSISTORS

TO ANSWER ALL THE QUESTIONS YOU WILL NEED TO DOWNLOAD THE 'TRANSISTORS' APP, FROM THE INTERACTIVE MOBILE APP SECTION OF [www.technologystudent.com](http://www.technologystudent.com)

**LINK**

<http://www.technologystudent.com/mobapps/transistors1.pdf>

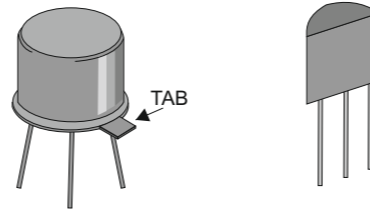
Once you have downloaded the App, you can use it to navigate the website. You may need to follow the links on each page of the App, to research / complete answers to all the questions.

**ARE YOU READY?  
USE THE MOBILE App!!**

**1**

### WHAT ARE TRANSISTORS?

Include reference to the two main types.




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**2**

TRANSISTORS USUALLY HAVE THREE LEADS (LEGS / PINS). NAME THEM AND ADD A BRIEF EXPLANATION

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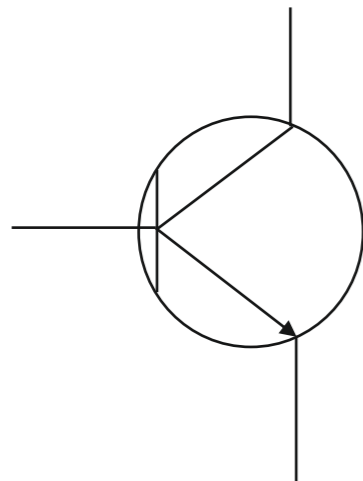
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**3**

LABEL/NAME THE THREE LEGS/LEADS/PINS ON THE TRANSISTOR SYMBOL BELOW.



**4**

THIS IS A SIMPLE TRANSISTOR CIRCUIT. EXPLAIN HOW IT WORKS AND EMPHASISE THE ROLE PLAYED BY THE TRANSISTOR. .

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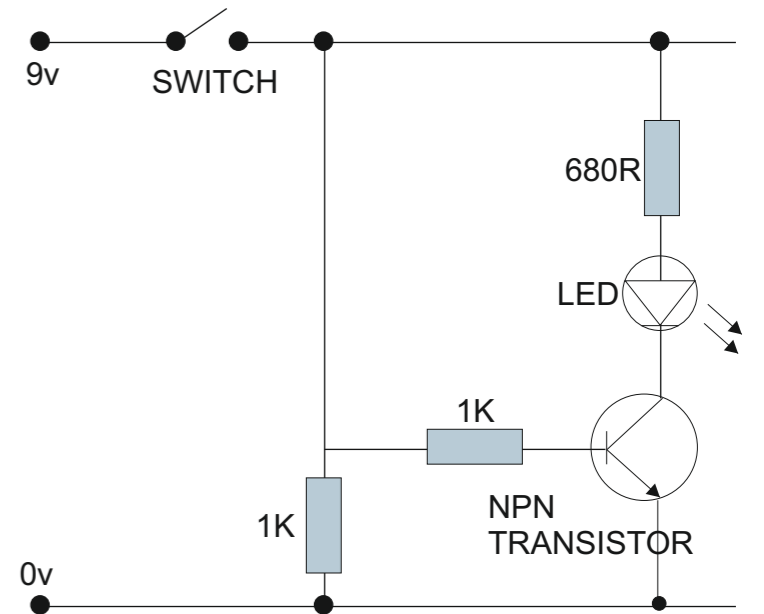
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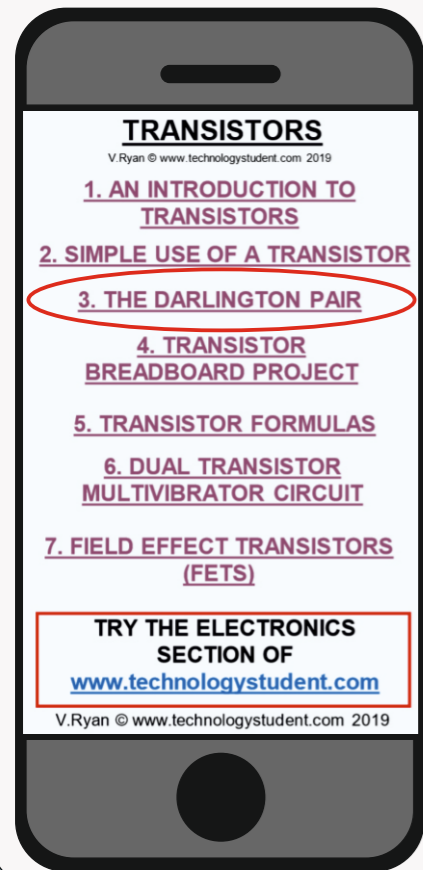
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### THE DARLINGTON PAIR

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### 1 IN SIMPLE TERMS, WHAT IS A DARLINGTON PAIR?

Make reference to the circuit diagram in the next box.

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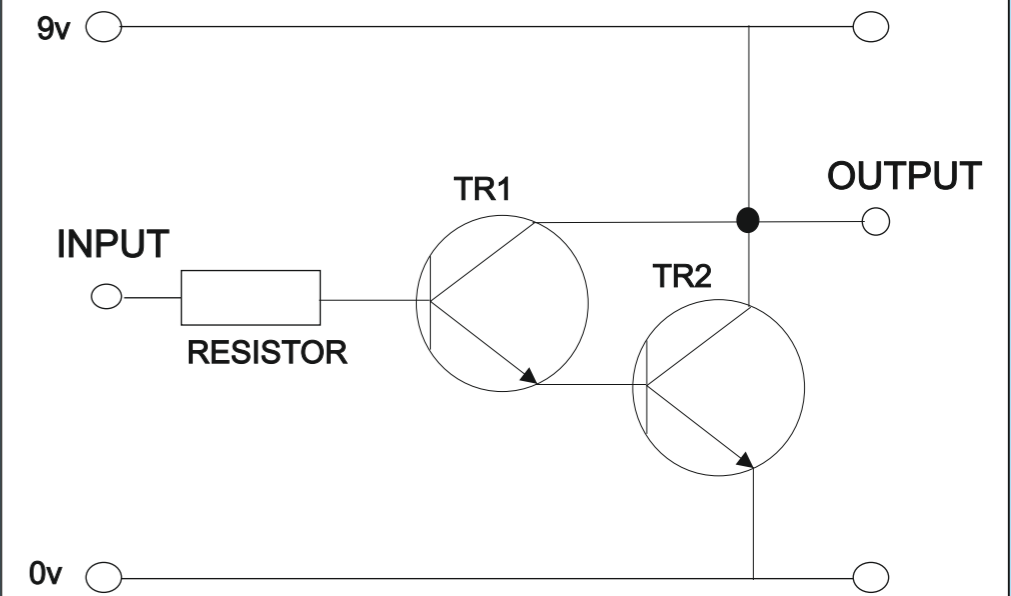
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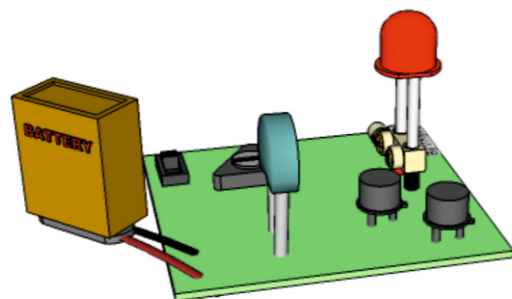
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### YOUR DARLINGTON PAIR DIAGRAM



### 2 THIS CIRCUIT HAS A DARLINGTON PAIR, A THERMISTOR AND OTHER COMPONENTS. WHAT IS ITS FUNCTION / PURPOSE?



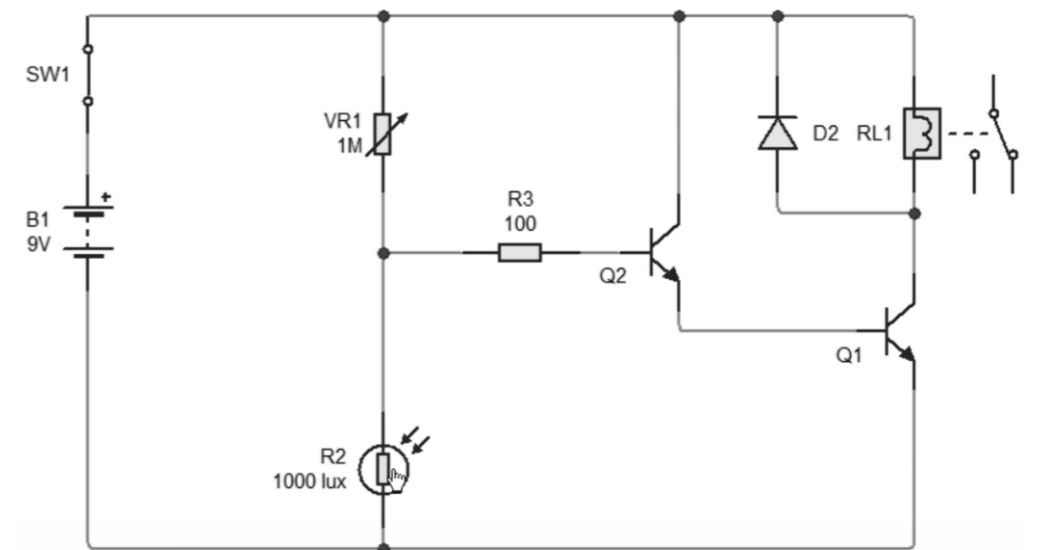

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### 3 THE CIRCUIT SHOWN BELOW, IS A LIGHT / DARK SENSOR. EXPLAIN HOW ITS WORKS AND EMPHASISE THE ROLE PLAYED BY THE DARLINGTON PAIR.




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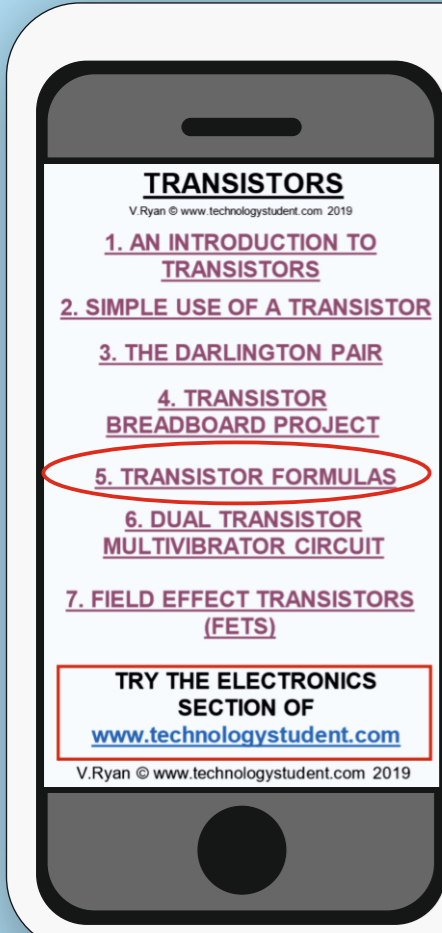
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## TRANSISTOR FORMULAS AND CALCULATIONS

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### LINK

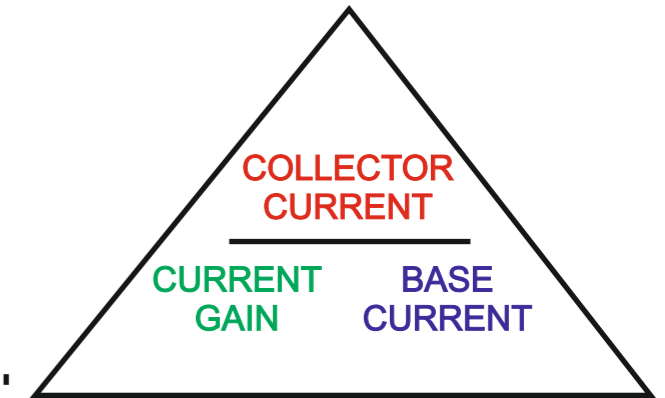
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Transistors are used to amplify current and so in an examination you could be asked to find the BASE current or COLLECTOR current or the GAIN. The GAIN is simply the amount of amplification. The formulas and example questions are set out below:

A simple way of remembering the formula is seen in the diagram opposite OR you can learn each of the formulas below.



$$\text{CURRENT GAIN} = \frac{\text{COLLECTOR CURRENT}}{\text{BASE CURRENT}}$$

$$\text{BASE CURRENT} = \frac{\text{COLLECTOR CURRENT}}{\text{CURRENT GAIN}}$$

$$\text{COLLECTOR CURRENT} = \text{BASE CURRENT} \times \text{CURRENT GAIN}$$

Another very important point to remember is that collector current is always greater than base current, sometimes by many times.

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### TRANSISTOR FORMULA/CALCULATION QUESTIONS

TRY THE CALCULATIONS IN THE NEXT BOX.

LOOK CAREFULLY AT THE FORMULA.

THE FIRST QUESTION HAS BEEN COMPLETED FOR YOU.

### TRY THE FOLLOWING QUESTIONS:

A. If the collector current of a transistor is 0.12 amps and the gain is 40, what is the base current?

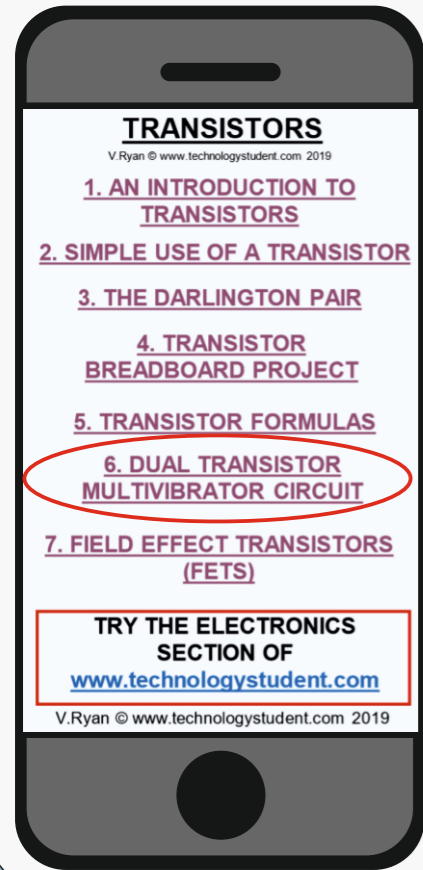
$$\text{BASE CURRENT} = \frac{\text{COLLECTOR CURRENT}}{\text{CURRENT GAIN}} = \frac{0.12}{40} = 0.003 \text{ amps or 3 milli-amps}$$

B. If the collector current of a transistor is 0.4 amps and the base current is 0.002 amps, what is the current gain?

$$\text{CURRENT GAIN} = \frac{\text{COLLECTOR CURRENT}}{\text{BASE CURRENT}} = \frac{0.4}{0.002} = 200$$

C. If the collector current of a transistor is 0.5 amps and the gain is 100, what is the base current?

$$\text{BASE CURRENT} = \frac{\text{COLLECTOR CURRENT}}{\text{CURRENT GAIN}} = \frac{0.5}{100} = 0.005 \text{ amps}$$



### DUAL TRANSISTOR MULTIVIBRATOR CIRCUITS

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**1**

**WHAT IS A DUAL TRANSISTOR MULTIVIBRATOR CIRCUIT?**  
Make reference to the circuit diagram, to support your answer

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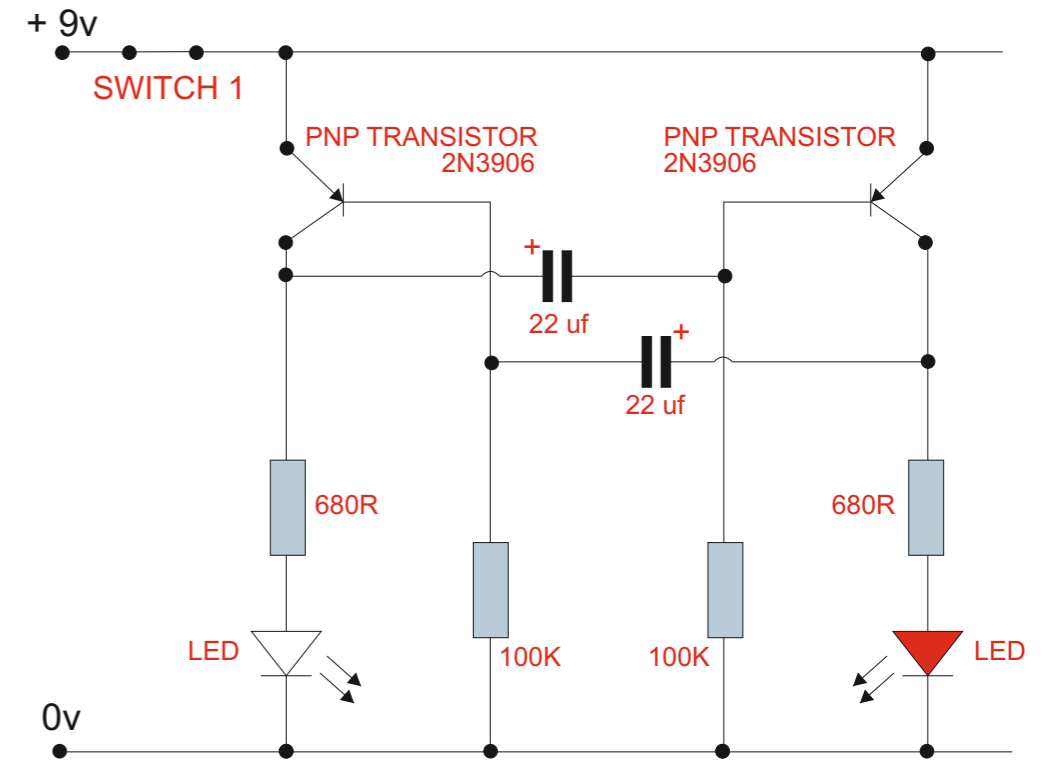
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**2**

**DESCRIBE TWO PRACTICAL APPLICATIONS OF THIS TYPE OF 'FLASHING' CIRCUIT.**

A: \_\_\_\_\_

\_\_\_\_\_

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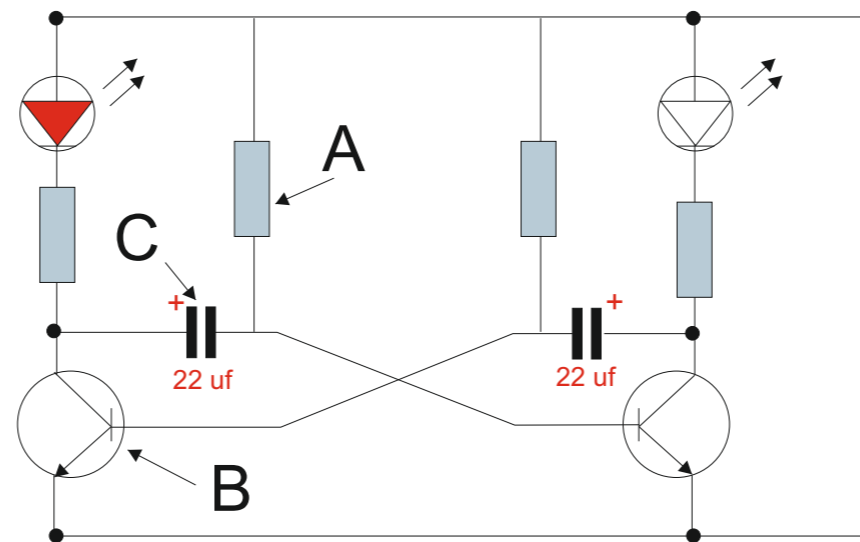
B: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**3**

**A GARAGE IS SELLING AN ELECTRONIC DEVICE, THAT HAS TWO LEDs, THAT FLASH ALTERNATELY. IT IS TO BE PLACED IN THE 'DASHBOARD OF A CAR, SO THAT IT LOOKS AS IF AN EXPENSIVE ALARM HAS BEEN FITTED. NAME AND DESCRIBE THE FUNCTIONS OF THE THREE COMPONENTS (A, B, C).**



COMPONENT A: \_\_\_\_\_

FUNCTION IN CIRCUIT: \_\_\_\_\_

\_\_\_\_\_

COMPONENT A: \_\_\_\_\_

FUNCTION IN CIRCUIT: \_\_\_\_\_

\_\_\_\_\_

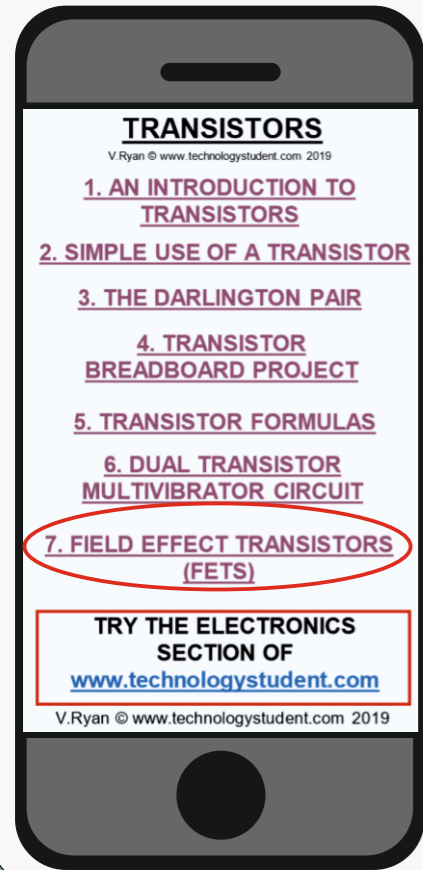
COMPONENT A: \_\_\_\_\_

FUNCTION IN CIRCUIT: \_\_\_\_\_

\_\_\_\_\_

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### FIELD EFFECT TRANSISTORS (FETS)

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**1**

A TYPICAL FIELD-EFFECT TRANSISTOR IS SEEN BELOW. DRAW THE SYMBOL REPRESENTING THIS COMPONENT.

SYMBOL

FET  
(Field-Effect Transistors)



**2**

DESCRIBE THREE PROPERTIES OF A TYPICAL FET.

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**3**

COMPLETE THE CLASSIFICATION OF COMMON FETs.

The first has been completed for you.

**JFET**  
*Junction Field Effect Transistor*

**MESFET-Metal**

**HEMT-High**

**MOSFET-Metal**

**4**

IN GENERAL TERMS, EXPLAIN HOW THIS CIRCUIT WORKS, WITH SPECIFIC REFERENCE TO THE ROLE OF THE MOSFET.

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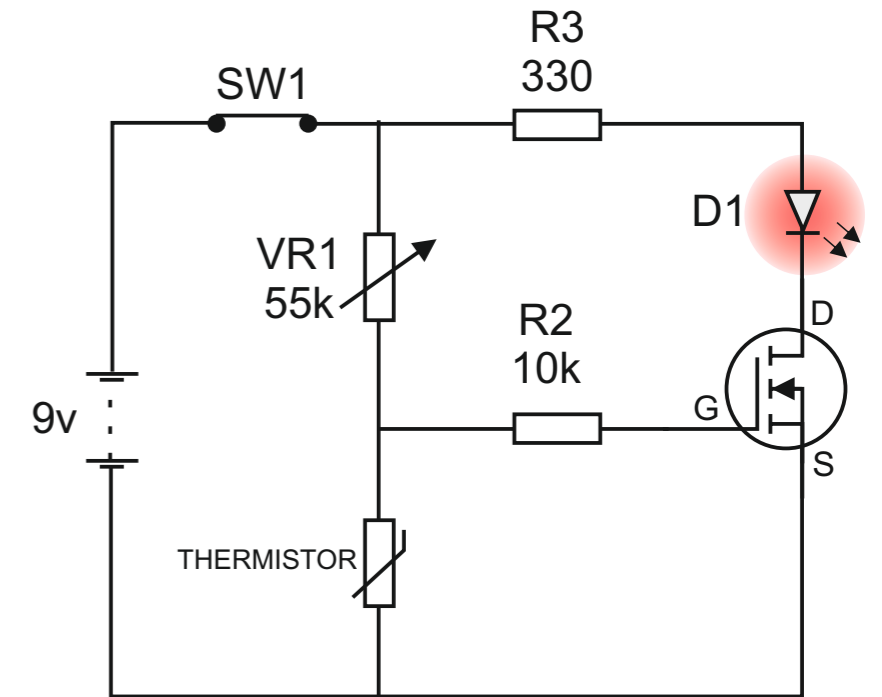
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