

# VCE Physics and VCE Systems Engineering: Table of electronic symbols

In response to requests from teachers the VCAA has produced a table of commonly used electronic symbols. Practicing teachers have provided advice in the selection of recommended and alternative symbols that appear in the table. Students may expect to see either the recommended or alternative symbols on the VCE Physics and VCE Systems Engineering examination papers. Teachers and students are likely to encounter the symbols shown in the table, and other symbols, in other publications. Teachers are encouraged to ensure students are flexible in their understanding and recognition of electronic symbols.

From the table, individual symbols may be selected, cut or copied and pasted into other documents and may assist teachers in the preparation of tests, revision sheets and drawing circuit diagrams.

All symbols have been generated using the **Drawing** tools in *Microsoft Word*. Each has been ‘**Grouped**’ so that it will remain intact when selected, copied and pasted to generate a circuit diagram.

The **recommended symbols** are provided in their acceptable orientation/s. The orientation of all symbols can be changed using the Drawing commands **Rotate Left**, **Rotate Right, Flip Vertical** or **Flip Horizontal**.

Aids in joining copied symbols by drawn lines on a required circuit diagram:

* On the **Drawing grid** set **Snap objects to other objects**.
* Under **AutoShapes**, select **Connectors**, then **Straight connector**.
* The dot (●) to indicate electrically connected points in the diagram can also be selected from the following table.

Enquiries regarding the table should be directed to the following Curriculum Managers: Technology Manager, Leanne Compton (03) 9032 1698 or [compton.leanne.l@edumail.vic.gov.au](mailto:compton.leanne.l@edumail.vic.gov.au)

Science Manager, Maria James (03) 9032 1722 or [james.maria.m@edumail.vic.gov.au](mailto:champion.neil.d@edumail.vic.gov.au)

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# Electric and electronic symbols for VCE Physics and VCE Systems Engineering

ELECTRIC AND ELECTRONIC SYMBOLS VCE SYSTEMS AND TECHNOLOGY AND VCE PHYSICS

For each component a **recommended symbol** is shown in its normally accepted orientation/s, i.e. vertically and/or horizontally. In electronics there is a longstanding convention to show most components with a vertical orientation and for the circuit to read from the source or input on the left to the output or remaining circuit on the right. Other **alternative symbols** that may be encountered are also shown. **Notes** include relevant acceptance of symbol.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Component group** | **Component** | **Recommended symbol** | **Alternative symbols** | **Notes** |
| sources | cell |  |  |  |
| battery,  DC power supply |  |  |  |
| variable DC power supply |  |  |  |
| AC power supply |  |  |  |
| resistors | resistor |  |  | Alternative symbol now regarded as outdated. |



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| --- | --- | --- | --- | --- | --- |
| **Component group** | **Component** | **Recommended symbol** | **Alternative symbols** | | **Notes** |
|  | variable resistor, |  |  |  | A variable resistor where |
|  | |
| potentiometer, | the variation is achieved by |
| voltage divider | use of a sliding contact. |
| variable resistor |  |  | | A general symbol for a |
|  |  | | variable resistor where the |
|  |  | | means of variation is not |
|  |  | | specified. |
| light-dependent |  |  | |  |
| resistor (LDR) |
| filament globe |  |  | |  |
| thermistor |  |  | |  |
| fuse |  |  | |  |

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| --- | --- | --- | --- | --- |
| **Component group** | **Component** | **Recommended symbol** | **Alternative symbols** | **Notes** |
| capacitors | (non-polarised) capacitor |  |  |  |
| variable capacitor |  |  |  |
| polarised capacitor, electrolytic capacitor |  |  |  |
| transformers | iron-cored transformer (one secondary winding) |  |  |  |
| iron-cored transformer (one secondary winding – centre-tapped) |  |  |  |
| iron-cored transformer (two secondary windings) |  |  |  |



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| **Component group** | **Component** | **Recommended symbol** | **Alternative symbols** | **Notes** |
| diodes | junction diode |  |  | Additional alternative |
|  |  | symbols for **all diodes** |
|  |  | include those where the |
|  |  | single straight-line section |
|  |  | of the symbol is shown as |
|  |  | a heavier line. |
|  | Zener diode |  |  |  |
|  | photo diode |  |  |  |
|  | light-emitting diode |  |  |  |
|  | (LED) |

# Component group

**Component Recommended symbol Alternative symbols Notes**

diode bridge

There are alternative forms using the other alternative symbols for the **junction diode** given above.

(Note that in an earlier version of this table, this symbol was incorrectly represented.)

transistors npn transistor Additional alternative

C C symbols for **all transistors**

B B include those where the

vertical straight-line section

E E of the symbol is shown as a heavier line.

pnp transistor Both orientations of the

C C recommended symbol are

B B used depending on whether the *emitter* (E) is

E E at the bottom or top.

E E

B B

C C

n-type junction field

effect transistor D D

(NJFET) G G

S S

p-type junction field

effect transistor D D

(PJFET) G S G

S



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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Component group** | **Component** | **Recommended symbol** | | **Alternative symbols** | | | | | **Notes** |
|  |  |  | |  | | | | |  |
| integrated | integrated circuit (IC) |  |  |  |  |  |  |  | This example shows an IC |
| circuits |  | 1  2 | 8  7 | 1  2 | 8  7 |  | 1  2 | 8  7 | with 8 connections. Others  occur, e.g. 14 and 16. |
|  |  | 3  4 | 6  5 | 3  4 | 6  5 |  | 3  4 | 6  5 | Under alternative symbols  identifying marks are |
|  |  |  |  |  |  |  |  |  | shown to indicate the |
|  |  |  |  |  | 1  3  4 | 8  7 |  |  | numbering of the connections.  Other conventions show  only the connections used |
|  |  |  |  |  |  |  |  |  | in a given circuit, here 1, 3, |
|  |  |  |  |  |  |  |  |  | 4, 7 and 8. |
| switches | single pole, single throw (SPST) switch |  | |  | | | | |  |
| single pole, double throw (SPDT) switch |  | |  | | | | |  |
| double pole, single throw (DPST) switch |  | |  | | | | |  |
| double pole, double throw (DPDT) switch |  | |  | | | | |  |

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| **Component group** | **Component** | **Recommended symbol** | | **Alternative symbols** | **Notes** |
|  |  |  | |  |  |
| normally open (NO) switch |  | |  |  |
| normally closed (NC) switch |  | |  |  |
| relay |  | |  |  |
| meters | ammeter | A A | | A |  |
| voltmeter | V V | | V |  |
|  |  |

|  |  |  |  |  |  |  |  |
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| **Component group** | **Component** | **Recommended symbol** | | | | **Alternative symbols** | **Notes** |
|  |  |  | | | |  |  |
| galvanometer |  | | | | G | The alternative symbol is not recommended as it is sometimes used to indicate a *generator*. |
| cathode ray oscilloscope (CRO) | CRO CRO | | | |  | Neither of these encountered symbols is widely used. |
| amplifiers | voltage amplifier |  | | | |  |  |
| operational amplifier (op amp) |  | | | |  | On the alternative symbol the two vertical connections are shown when it is connected to the power supply. |
| transducers | motor |  | | | | M M |  |
|  | |  | |
|  |  | |  |
|  |  |

# Component group

**Component Recommended symbol Alternative symbols Notes**



microphone

loudspeaker

logic gates NOT or invert gate

1

OR gate

 1

XOR (exclusive OR) gate

= 1

NOR gate

 1

&



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| --- | --- | --- | --- | --- |
| **Component group** | **Component** | **Recommended symbol** | **Alternative symbols** | **Notes** |
|  |  |  |  |  |
|  | AND gate |  |  |  |
|  |  |  | & |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  | NAND gate |  |  |  |
|  |  |  | & |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
| flip-flop | T (toggle) flip-flop |  |  |  |
|  |  |  |  |  |
|  |  | Q Q |  |  |
|  |  | T T |  |  |
|  |  |  |  |  |
|  |  | Q Q |  |  |
|  |  |  |  |  |
| external  connections | earth | falling edge rising edge  triggered triggered |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  | aerial |  |  |  |
|  |  |  |  |  |
| circuit  connections | non-connected leads |  |  | Alternative symbol  regarded as outdated. |

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| --- | --- | --- | --- | --- |
| **Component group** | **Component** | **Recommended symbol** | **Alternative symbols** | **Notes** |
|  |  |  |  |  |
| connected leads |  |  |  |
| dot for junction of connected leads |  |  |  |