

Resistors

Resistors with a tolerance of 2 per cent or worse have four coloured bands. Each colour codes for a number, as shown opposite.

The tolerance band (red, gold or silver) will be set apart from the other three. Place it on the right.

The first two bands on the left code for a two-digit number between 10 and 99. For example, yellow and purple code for the number 47.

The third band on the left codes for the number of noughts to place after the two-digit number. For example, a red band tells you to place two noughts after the two-digit number.

So yellow, purple and red bands from left to right on a resistor tell you that it has the value of 4700 Ω or 4.7 k Ω . Similarly, the bands on a 10 k Ω resistor will be brown, black and orange.



colour	number
black	0
brown	1
red	2
orange	3
yellow	4
green	5
blue	6
purple	7
grey	8
white	9

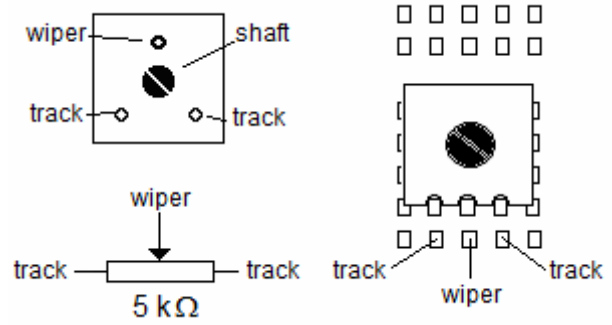
The table below shows the pattern of bands on the resistors you will be using for practical work.

The carbon film resistors have a maximum power rating of 250 mW and a tolerance of 5 per cent (gold).

tens □	units □	noughts					
		brown	red	orange	yellow	green	blue
brown	black	100 Ω	1 k Ω	10 k Ω	100 k Ω	1 M Ω	10 M Ω
red	red	220 Ω	2.2 k Ω	22 k Ω	220 k Ω	2.2 M Ω	-
yellow	purple	470 Ω	4.7 k Ω	47 k Ω	470 k Ω	4.7 M Ω	-

Potentiometer

Your potentiometer has three terminals coming out of the base. The resistance between the two outer track terminals is a fixed 5 kΩ. The resistance between the wiper and each track terminal can be varied from 0 kΩ to 5 kΩ by rotating the shaft with a screwdriver.



Capacitors

All of your capacitors are radial, with the leads coming out of the base. The larger capacitors, shown opposite, will be **electrolytic**. They have a polarity, with the lower voltage terminal marked with a minus sign on the case. Their high voltage rating means that they are unlikely to explode when incorrectly connected - but be careful!

capacitance	marking	voltage
1000 μF	1000UF	35 V
100 μF	100UF	63 V
10 μF	10UF	63 V
1 μF	1UF	63 V

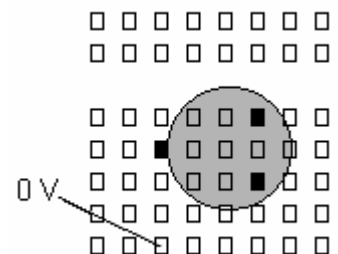
The following capacitors will not have a polarity, so you can insert them either way round:

100 nF 10 nF 1 nF 100 pF

The variable capacitor has a range of 6 pF to 65 pF.

You will need to adjust it with a screwdriver.

Mounting it as shown will reduce changes in capacitance as the screwdriver approaches and leaves the spindle.



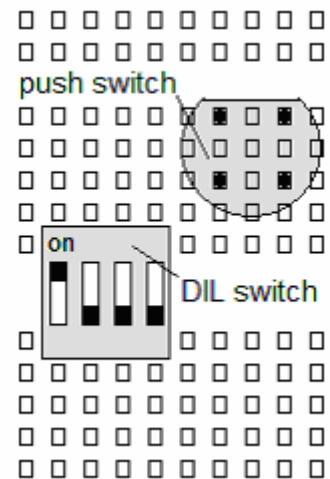
Switches

Identify the flat side of the push switch before you insert it.

The flat side should go parallel to the top supply rail.

Press the switch to connect all four terminals coming out of its base.

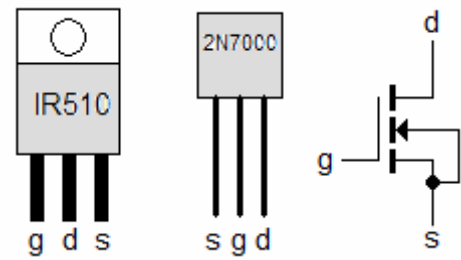
The DIL (dual in-line) switch should be inserted across the central gap. Have the ON label at the top. Any switch in the ON position connects across the central gap. Don't forget to use pull-down resistors between each open switch and a supply rail.



MOSFETs

Both MOSFETs are pictured as viewed from the front, with their code numbers facing you. The drain always sinks current from the load.

The 2N7000 has a maximum rated current of 350 mA.



Diodes

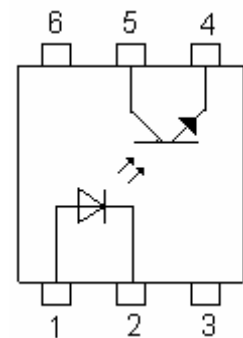
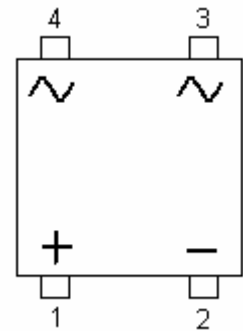
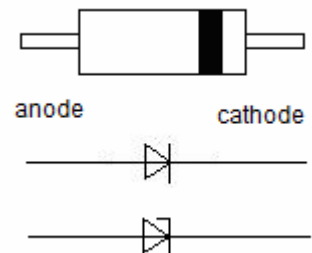
Both silicon and zener diodes have a black bar at one end. This denotes the cathode of the diode, the terminal which must be at a lower voltage to place the diode in forward bias.

The 1N4148 signal diode is rated at 500 mW, 150 mA.

The OA91 germanium diode has a voltage drop of 200 mV at 100 μA.

The diode bridge is rated at a maximum current of 1 A.

The forward voltage drop is about 1.4 V.



Optoisolator

The infra-red LED maximum rating is 100 mW, at a current of 60 mA.

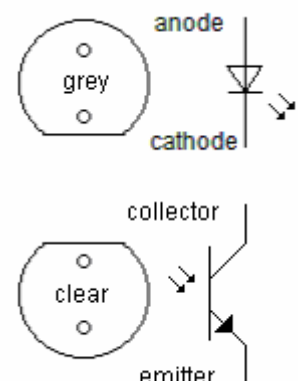
The phototransistor has a maximum current of 50 mA, at a power of 150 mW.

Both devices can sustain a reverse voltage of 5 V.

Infrared

The L7113 infrared LED has a forward voltage drop of 1.4 V at a current of 20 mA. The matched L7113 phototransistor has a dark current of 100 nA and a response time of 15 μs.

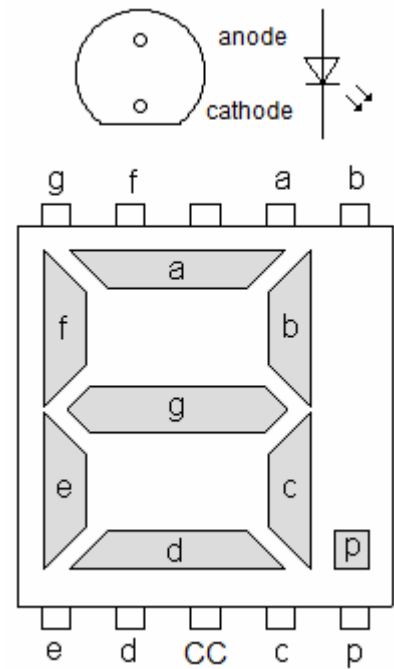
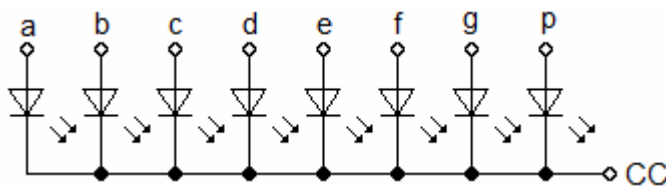
Both devices have a power rating of 80 mW and can cope with reverse voltages of 5 V. Note that the sensitive surface of each device is under the lens at the top.



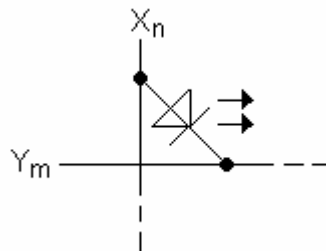
LEDs

Look for the flat edge on a single LED. This shows you where the cathode is, the terminal which must be at a lower voltage to make the LED glow. The reverse bias voltage across an LED should not exceed 5 V.

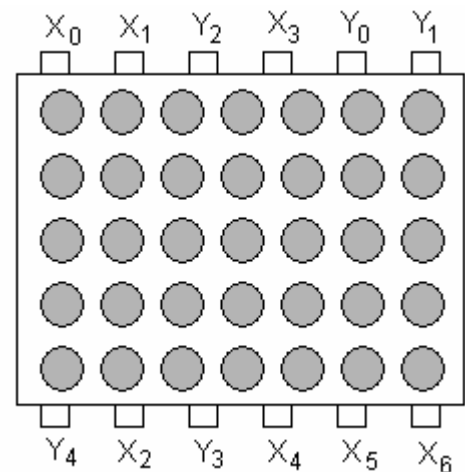
The seven-segment LED contains eight LEDs with their cathodes connected to a common terminal CC. This could be connected to 0 V by a 220 Ω current-limiting resistor.



The dot matrix LED contains 35 LEDs. Each LED is connected between a column (X_n) and a row (Y_m) as shown below.



X_0Y_0 is at the top left-hand, X_6Y_4 at the bottom right-hand.



Pulse transformer

Three independent coils are wound around the same core. Two connected in series make a primary coil with double the coils of the secondary, as shown opposite.

