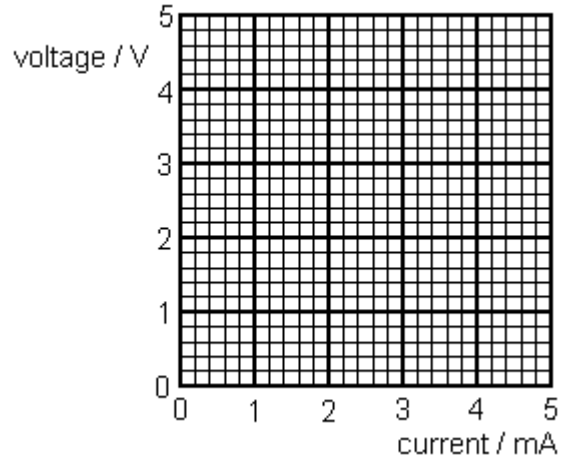
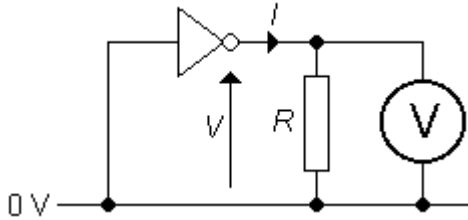


**Sourcing and sinking current from a NOT gate**

You are going to find out how bad CMOS NOT gates are at handling large currents.

- 1 Assemble the circuit shown below on breadboard. Use a 10 kΩ resistor as the load *R*. Don't forget the +5 V and 0 V connections for the integrated circuit.

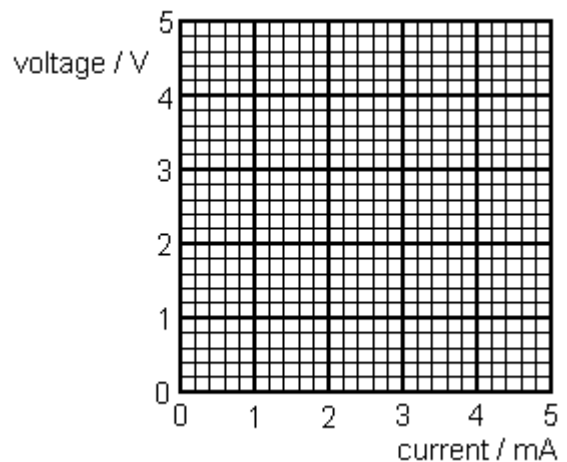
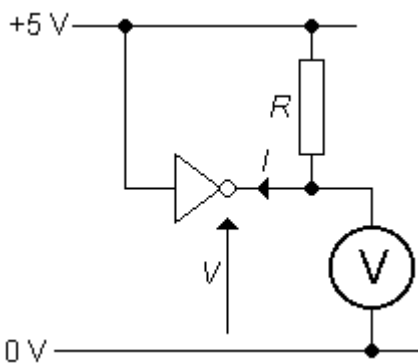


- 2 Use the circuit and the rule  $I = \frac{V}{R}$  to complete the table below.

- 3 Use the last two columns of the table to plot a voltage-current graph for the NOT gate sourcing current into a load.

<i>R</i>	<i>V</i>	<i>I</i>
10 kΩ		
4.7 kΩ		
2.2 kΩ		
1.0 kΩ		
470 Ω		
220 Ω		

- 4 Alter the circuit so that the NOT gate sinks current from the load, as shown below.

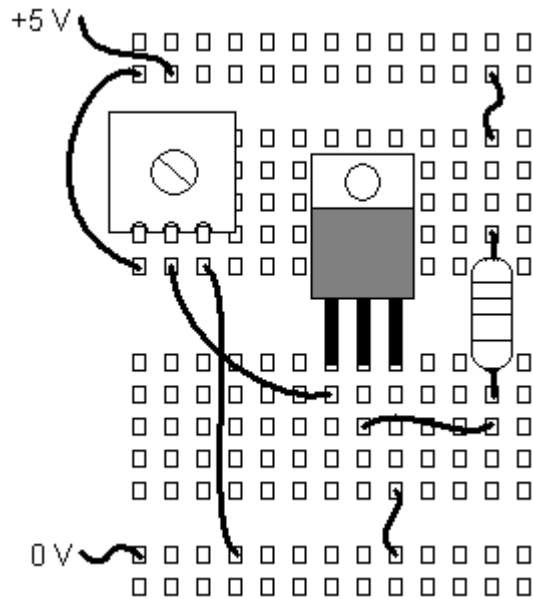
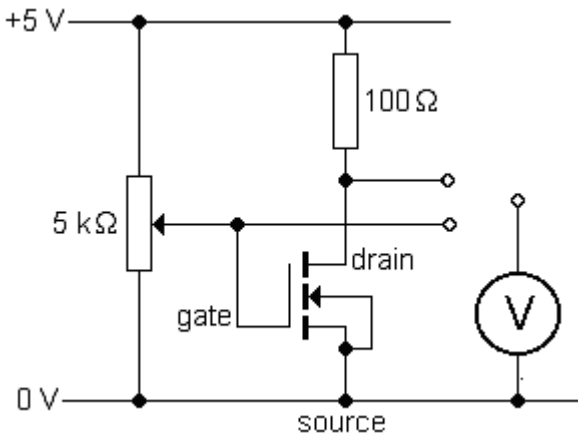


- 5 Use the circuit to obtain data to plot a voltage-current graph for the NOT gate when it sinks current. Don't forget to use the voltage drop across the resistor to calculate the current.

**Transfer characteristic of a MOSFET driver**

You are going to find out how to alter the drain-source resistance of an IRF510 MOSFET.

- 1 Assemble the circuit shown below on breadboard.



- 2 Connect the voltmeter to the drain. Verify that rotating the potentiometer shaft allows the drain voltage to go between +5 V and 0 V.

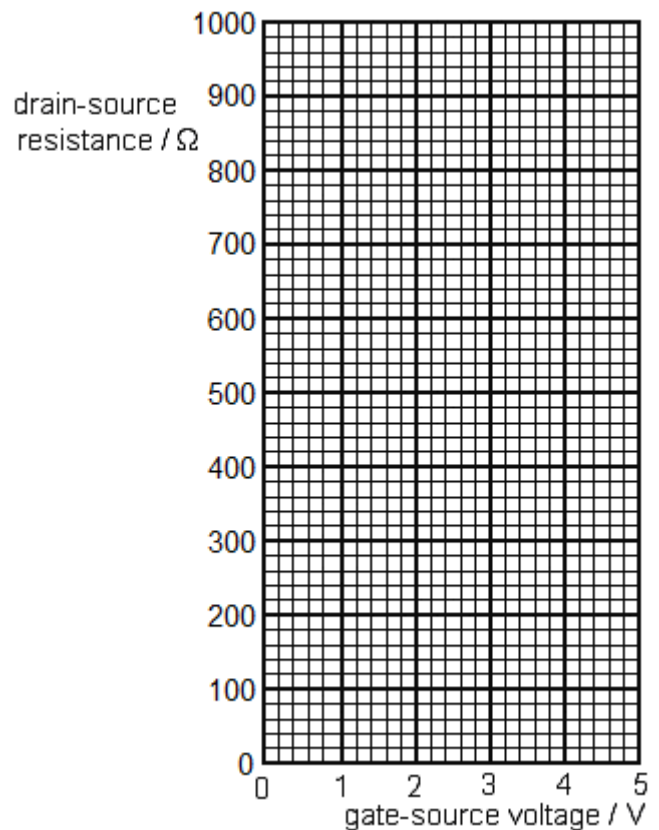
- 3 Set the gate-source voltage to 5 V. Measure the drain-source voltage (about 0.03 V).

- 4 Use the resistor voltage drop and  $I = \frac{V}{R}$  to calculate the drain current.

- 5 Now use  $R = \frac{V}{I}$  to calculate the MOSFET resistance from the drain-source voltage and the drain current. It should be about 0.5 Ω.

- 6 Use your measurements to plot a point on the graph.

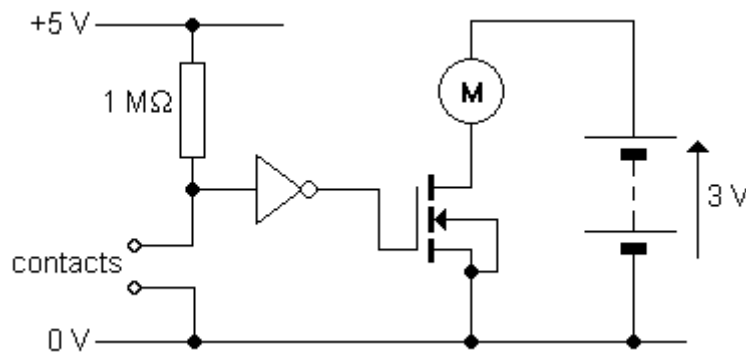
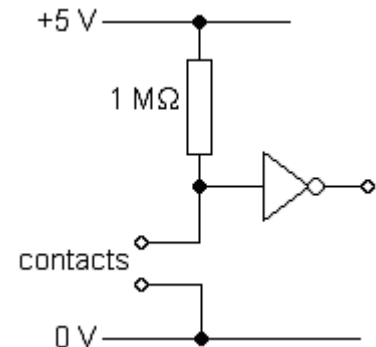
- 7 Repeat the procedure to plot other points on the graph.



**Touch controlled motor**

You are going to assemble and test a circuit which will allow you to use the resistance of a finger to turn a motor on and off.

- 1 Start off by assembling the circuit shown opposite.  
The contacts are the ends of a pair of wires coming out of the breadboard.
- 2 Use a voltmeter to verify that the output terminal goes high when you grasp the contacts with your hands. You may need to moisten your fingers.
- 3 Now add a MOSFET, motor and 3 V power supply, as shown below.  
Ensure that the drain is at a higher voltage than the source.



- 4 If all is well, the motor should only spin when you grasp the contacts with your hands.
- 5 Adapt the circuit so that it behaves as follows:
  - the output is a 12 V, 100 mW lamp
  - the lamp only goes off when the contacts are grasped.