Darlington pair

This is two transistors connected together so that the current amplified by the first is amplified further by the second transistor. The overall current gain is equal to the two individual gains multiplied together:
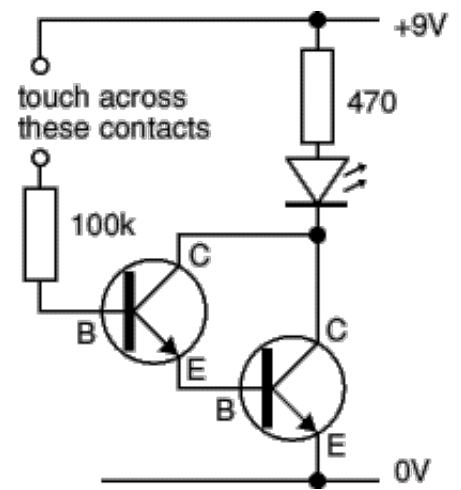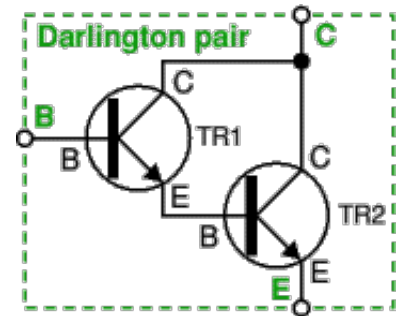

Darlington pair

Darlington pair current gain, h_{FE} = h_{FE1} × h_{FE2}
(h_{FE1} and h_{FE2} are the gains of the individual transistors)

This gives the Darlington pair a very high current gain, such as 10000, so that only a tiny base current is required to make the pair switch on.

A Darlington pair behaves like a single transistor with a very high current gain. It has three leads (**B**, **C** and **E**) which are equivalent to the leads of a standard individual transistor. To turn on there must be 0.7V across both the base-emitter junctions which are connected in series inside the Darlington pair, therefore it requires 1.4V to turn on.

Darlington pairs are available as complete packages but you can make up your own from two transistors; TR1 can be a low power type, but normally TR2 will need to be high power. The maximum collector current Ic(max) for the pair is the same as Ic(max) for TR2.

Touch switch circuit

A Darlington pair is sufficiently sensitive to respond to the small current passed by your skin and it can be used to make a **touch-switch** as shown in the diagram. For this circuit which just lights an LED the two transistors can be any general purpose low power transistors. The 100kΩ resistor protects the transistors if the contacts are linked with a piece of wire.