Craig's Guide to LEDs

See p823 of catalogue 2011/12 –
NOTE: A significant amount of our LEDs in the catalogue are now discontinued.

LEDs are ***VERY*** different from 'bulbs' - see appendix.

Find out the customer's main requirement when searching for an alternative e.g. colour, size or brightness. Whenever possible invite the customers to use the info hub or thumb through the catalogue themselves, as it can take AGES!

If the customer doesn't need anything 'fancy' e.g. high-brightness, smaller or larger sizes, or special colours, then the lucky bags/multipacks of 5mm LEDs on W038 offer excellent value per device. This saves a HUGE amount of time too!
(Do take a quick look at these lucky bags, and the others too, as they could save you some hassle in the future!)

A series resistor is almost ALWAYS required with an LED to prevent it burning out. **There is a simple equation to work out the value of resistor required on page 823**.
This will depend on the specifications of the LED, and the voltage being supplied to it. For example: if it is being fitted into a car, then the supply voltage is 13.8v.

SALES

The P&C for LEDs is the appropriately sized clip e.g. 3mm, 5mm, 8mm or 10mm.
The ideal add-on is the series resistor, and again there are multipacks on W038.
Another add-on is heatshrink to insulate the LED's legs and prevent an electrical short, which could be dangerous!

Item [BF87] 2.5mm heatshrink on **G095** is just the right size to slip over a 0.6W resistor.

Does the customer require a soldering iron?
The Antex irons are excellent quality (Craig's personal recommendation!) and the 18W variant [FY62] is a great all-rounder for small electronic jobs.
The soldering iron stand FR20 is very sturdy and comes with a sponge for cleaning the tip too.

(Tip packs N14FR & N15FR fit the above-mentioned iron)

What about solder?

A de-soldering pump to help remove the faulty component? [N40CH]

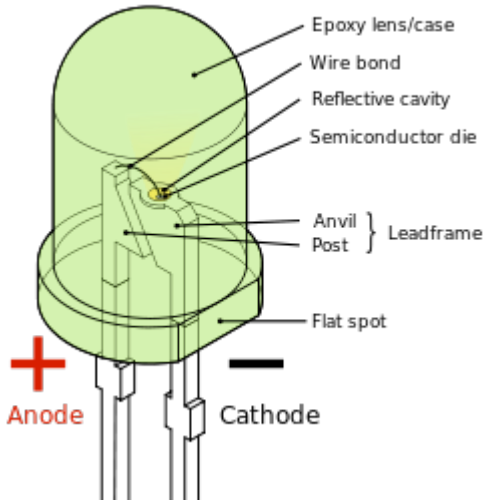
If the customer has never soldered before, we sell a small book called 'The Art of Soldering' [CJ23] for just £3.99

APPENDIX

A filament lamp produces light because it becomes heated to such a high temperature: heat is simply the kinetic energy of particle motion (the more the teeny-tiny things whizz around, the hotter the big thing that's made of the teeny-tiny things becomes!). The high melting point of tungsten, in combination with the absence of oxygen in the glass bulb, prevents the filament burning out.

LEDs are semiconductor diodes that produce light when forward biased. This means that electrons (which have negative charge), flow across the P-N junction* from the n-side (cathode or -ve) to the p-side (anode or +ve) and fall into 'holes' at lower energy levels. The excess of energy is then emitted as a photon (light).

**see Craig's Guide to Diodes*



The anode (+ve) of the LED is connected to the longer leg. The cathode (-ve) as well as having a shorter leg, usually has a 'flat' on the corresponding side of the package.

The resistance when forward biased is fairly low so when a higher-than-required voltage is applied, a large current can potentially flow, damaging the device permanently. For this reason, a current-limiting resistor should always be connected in series.

Standard white LEDs are constructed from blue LED chips with a phosphor coating emitting primarily yellow wavelengths to make them 'appear' white. They produce low levels of green wavelengths and hardly any red. This is fine for signs or indications, or small hatch-back cars where colour isn't important. A warm-white LED however produces a more natural light, which is better suited for sources of illumination such as lamps.

There is a simple equation to work out the value of resistor required on page 823, and shown here:

$$\frac{v_s - v_f}{i_f} = r$$

Where v_s is the supply voltage, v_f is the forward voltage of the LED, i_f is the forward current of the LED and r is the value of resistor required.

We can put some typical figures in here, for a bog-standard red LED in a car. The car's electrical system runs at 13.8v, the forward voltage of the LED is 2v and its forward current is 20mA (0.02A):

$$\frac{13.8v - 2.0v}{0.02A} = 590\Omega$$

I would advise the use of a 620Ω resistor in this case, as it is the next value higher. This means the LED will run at just under its maximum rating, which is safer!

NOTE: It is safer to use a higher value than a lower value of resistor if the exact equated value is not available.

Bibliography

Oxford Reference. (1992). *Concise Science Dictionary.* (A. Isaacs, J. Daintith, & E. Martin, Eds.) UK.

Plant, M. (2010). *Understand Electronics.* UK: Hodder Education.