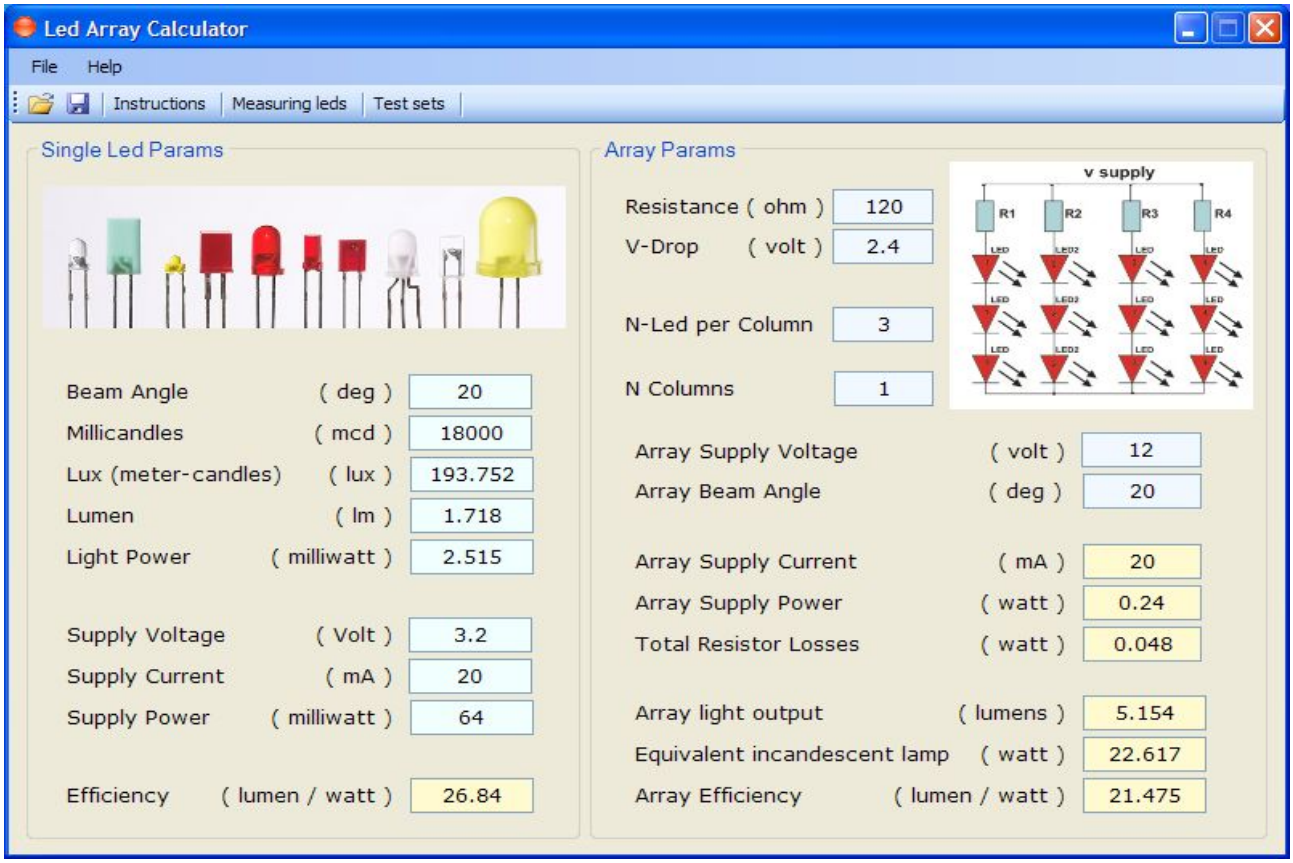
The program "Led Calc"



The left panel "Single Led Params" refers to the single LED and is calculated first.

The right panel "Array Params" is designed around an array of "n" rows and "n" columns led all the same and is calculated in accordance with the data on the individual LEDs.

The values in yellow are the results of calculations and can not be changed, while the values in blue can be changed by writing a value or moving the mouse up and down.

Every time you change one of the values that are all dependent values are continuously recalculated and are always kept valid.

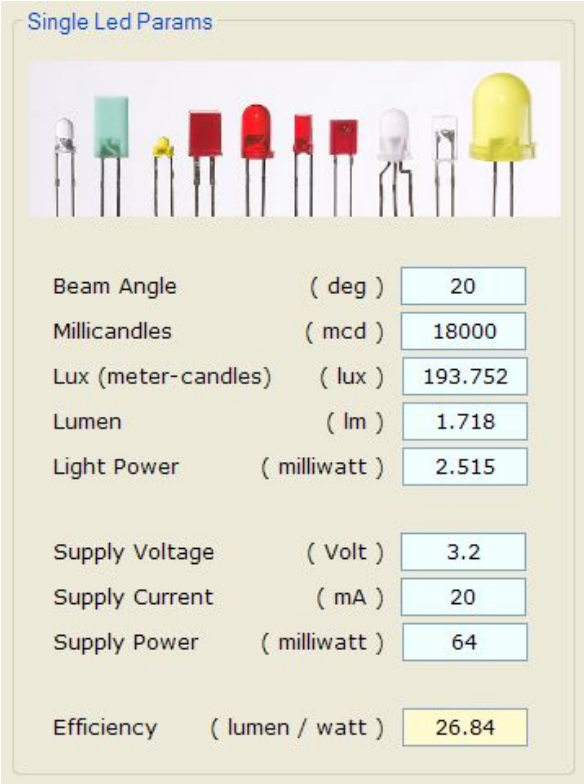
With any combination of values does not generate errors but it is said that the numbers shown always make sense or that are possible in reality. For example, the '"efficiency" can never be greater than 683 lumens per watt, if it becomes mean that you have placed unrealistic values in some cells.

The most common error conditions are shown with the background color of the box that turns red.

The parameters of the "Single Led"

Beam Angle

The opening angle of the light beam within which the emission is at least 50% of the maximum. (Using grades - you must use the total angle, not the half angle and 360 degrees indicate uniform emission in all directions)



Millicandles

Unit of measure commonly used to measure the LEDs.
The light output in "milli-candle" or "mcd" (thousandths of a foot candle) is equal to one thousandth of the light of a candle standard view from the distance of a foot.

Lux

The light output in "Lux" or "Meter candle" is the light of a candle standard view from the distance of one meter. The "lux" is directly linked to the "thousand-candle"
1 lux (meter-candles) = 0.09290304 foot-candles

Lumen

The lumen depreciation is calculated by the "milli candle" and "angle" taking into account "stearadians" (square of the cosine of the angle)

Light Power

This is the "light power" and is directly connected to the "lumens" (1 watt = 683 lumens of light)

Supply Voltage

The voltage that is measured on the LED when the current is the nominal one (usually from 1.8 to 3.5 volts)

Supply Current

The supply current of the LED in milliamps (usually 20mA)

Power Supply

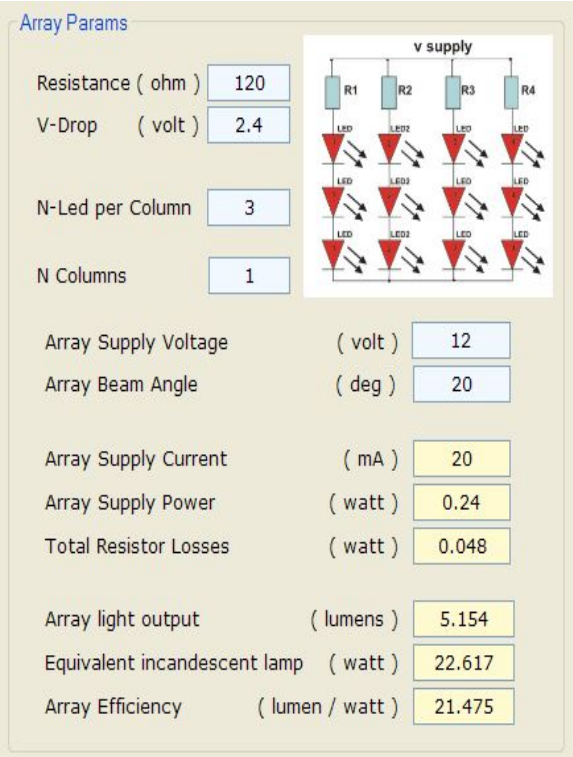
The power supply LEDs in milliwatts (supply voltage * supply current)

Efficiency

The efficiency of LEDs is measured in "lumens of light produced per watt of electricity consumed"
Since a watt of light is equal to 683 lumens, the value of "683 lumens per watt" is the maximum efficiency that would occur if 100% of electricity is converted into light. This value can not be reached in practice and can not be overcome even in theory. The "normal" values are as follows.

	Lumen per Watt	**Percentage of the theoretical maximum quantum (100% = 683 lumens per watt)**
Incandescent lamps	10 to 20	from 1.5% to 3%
100-watt incandescent lamps	13 to 17	from 2% to 2.5%
Fluorescent lamps, energy-saving	50 to 70	from 7.5% to 10%
Led	10 to 100	from 1.5% to 15%

The parameters of the "Led Array"



Resistance
The value of resistors placed in series to each column of LEDs.

V-Drop
The voltage drop caused by the resistors.
It would be good to use a fall high enough so as to stabilize the current, but this voltage is high more and more the efficiency decreases.

N-Led Column
Number of LEDs for each column, the supply voltage of the array and the total efficiency are highly dependent on this parameter. A method to maintain a good efficiency even with some volts of "v-drop" is to make long columns and food with very high voltage (also from 50 to 300 V)

N Columns
Number of columns, increase the columns increases the total power of the panel. All other values remain unchanged.

Array Supply Voltage
The supply voltage of the panel that depends mainly on the number of LEDs per column.

Array Beam Angle
Usually the beam aperture of a panel of LEDs is equal to that of the single LED but sometimes the LEDs are arranged on a sphere or of a half sphere. (See notes on next page)

Supply Current Array
The supply current of the panel in milliamperes. (Current of each LED by the number of columns)

Array Power Supply
The total power panel power in watts.

Total Losses Resistor
The total power lost due to the resistors.
It 'good that this value is small enough so that the efficiency is not affected too much.

Array Light Output
The total light power produced by the panel.

Equivalent incandescent lamp
The power that should have an incandescent lamp to produce the same light. (See notes on next page)

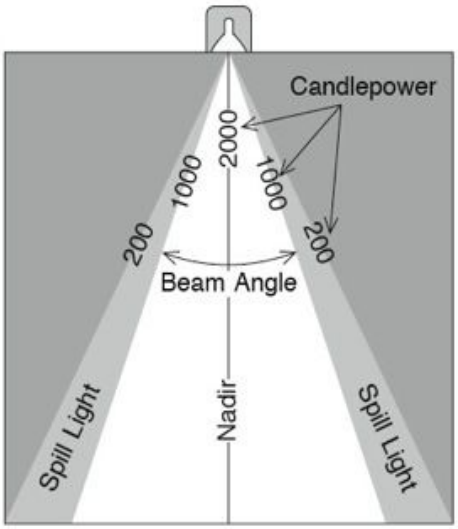
Array Efficiency
The panel efficiency in lumens per watt (maximum of 683 lumens per watt)

Notes for "Equivalent incandescent lamp"

It uses this value to "Lamp equivalent" because we are used to assess the light "bulb 100w" or "75w bulb", while the "lumens" does not tell us anything.

Which considers as equivalent to a standard bulb lamp, bulb, 100w (which emits about 1500 lumens)

Incandescent lamps emit light in all directions, but in normal situations there is always a reflector or white ceiling so the light that we are accustomed to consider is about twice that we would have if the bulb was hanging by a thread in a room painted black.

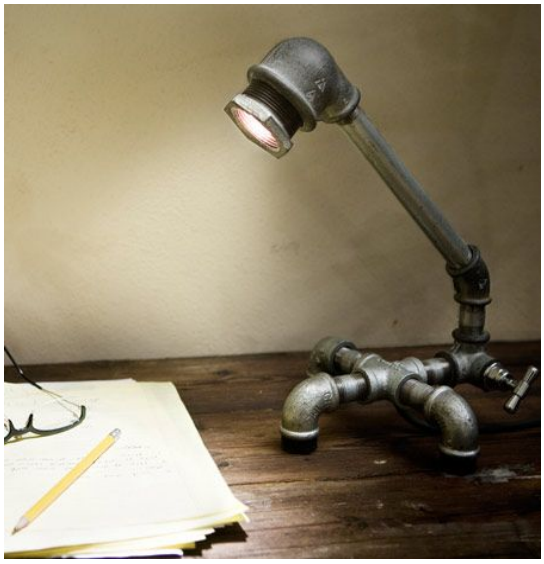


The beam angle is defined where candlepower falls to 50%.

Instead, all the LEDs emit light in a narrow beam so that the light that reaches the work plan must be multiplied by four times to five times (from 120 to 10 degrees beam-width)

You must also take into account that the light of our interest is the one that reaches the working plane (or the book we are reading) for which you have to apply further corrections.

Usually the beam aperture of a panel of LEDs is equal to that of the single LED but sometimes the LEDs are arranged on a sphere or of a half sphere. In other cases, the LEDs are arranged on a cylinder-shaped light bulb that will probably be mounted in a chandelier that reflects the light downward.



All corrections being talked about on this page are automatically calculated by the program LedCalc, just adjust the parameter "Array Beam Angle"

Kozo Lamp-
http://www.dezeen.com/2009/03/31/kozo-lamps-by-david-benatan