

Calculating the number of LEDs

Selecting the right driver for your application

Figuring out which driver fits your application best can be pretty frustrating when your line of work is not electrical engineering. What it boils down to is this: if you know which type of LED you will be using in your application, you can select the right driver by its operating window.

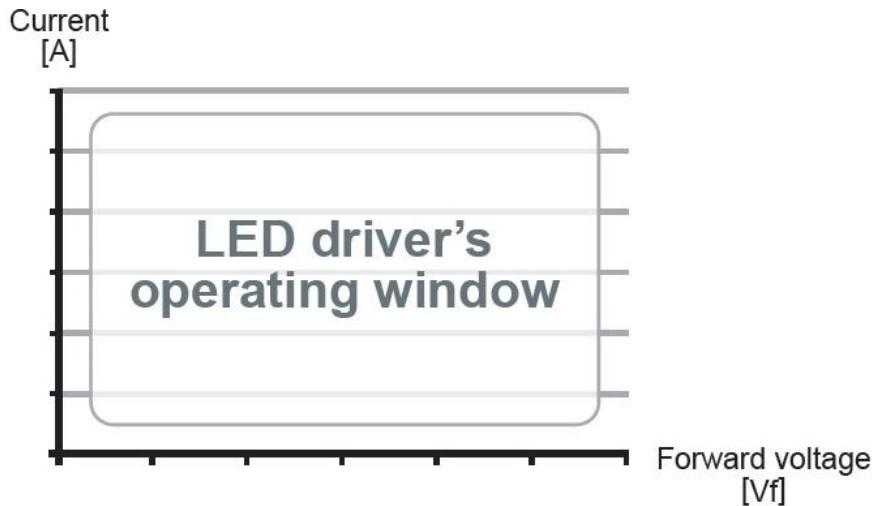


Figure 1 – Operating window

If you are scratching your head when hearing this term and seeing the diagram above – DON'T PANIC! Get the datasheets of both LED and LED driver and do the Voltage-Current-Wattage check.

Voltage-Current-Wattage check

From the LED's and LED driver's datasheet, dig up the following data:

1. LED: forward voltage (V_f)
2. LED driver: maximum forward voltage per LED output (V_f) and maximum power output (W)

Allow us to walk you through this exercise using the 50W SOLOdrive 560/S as the LED driver of choice and a common LED with a 3.5V forward voltage.

1. The LED's forward voltage: 3.5V
2. The SOLOdrive 560/S' maximum forward voltage per LED output: 55V
3. The SOLOdrive 560/S' maximum power output: 50W

Step 1: Voltage check

Just looking at the forward voltage data, one would assume that it is possible to connect $55V / 3.5V =$ approximately 15 LEDs to an LED output. As the SOLOdrive 560/S has two LED outputs, and each of them offers 55V, this would be amount to 2×15 LEDs = 30 LEDs.

However, there are two other elements that play an important role in this equation: the current you wish to drive the LED at, and the *maximum power* delivered by the LED driver.

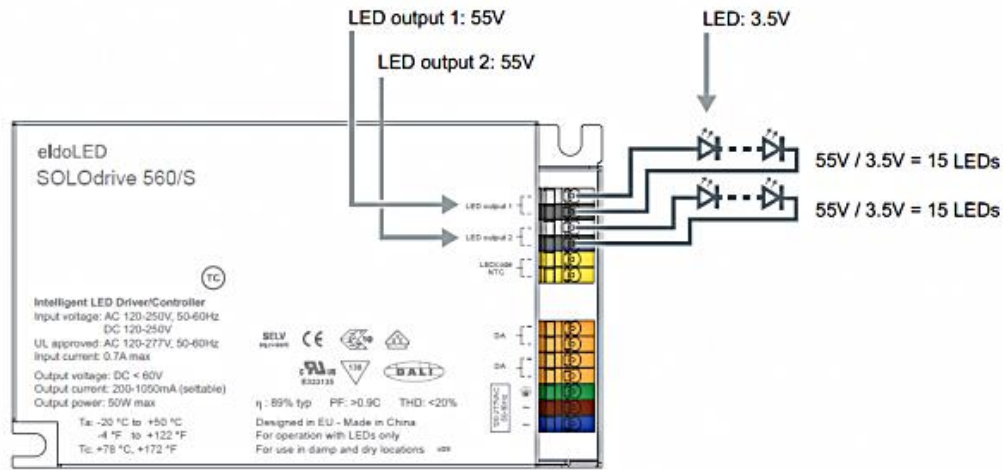


Figure 2 – Voltage check

Step 2: Current & Wattage check

Let's assume that your application requires you to drive the LEDs at 0.7A in order to reach the desired light output.

Remember, you have 15 LEDs with a 3.5Vf connected to each LED output. This means that the LEDs actually use up $15 \times 3.5V = 52.5V$ of the voltage offered by each LED output. Multiplying this total forward voltage used by the LEDs with the current that the LED output has been set to will give you the total power that is asked from that LED output: Voltage (V) \times Current (A) = Power (W).

So if the LED outputs' current in our example are indeed set to 0.7A (700mA), the LEDs would use:

- LED output 1: $52.5V \times 0.7A = 36.75W$
- LED output 2: $52.5V \times 0.7A = 36.75W$
- Total output power: 73.5W

As 73.5W exceeds the LED driver's maximum power output of 50W, you have 3 options:

A. *If you do not wish to deviate from 0.7A output current: CONNECT LESS LEDs.*

$$\begin{aligned} \text{Voltage (V)} \times \text{Current (A)} &= \text{Power (W)} \\ \text{Voltage (V)} &= \text{Power (W)} / \text{Current (A)} \\ \text{Voltage (V)} &= 50W / 0.7A = 71.4V \end{aligned}$$

The above calculation shows that when a 50W driver is set to 0.7A LED output current, you actually have 71.4V available. Divided by the LED's 3.5V forward voltage, this means you can connect a maximum of 20 LEDs (instead of 30).

B. *If the 30 LEDs are more important than the amount of light output: OPERATE THE LEDs AT A LOWER CURRENT.*

The LED output current of the SOLOdrive 560/S can be changed to another value using the TOOLbox pro and FluxTool software.

$$\begin{aligned} \text{Voltage (V)} \times \text{Current (A)} &= \text{Power (W)} \\ \text{Current (A)} &= \text{Power (W)} / \text{Voltage (V)} \\ \text{Current (A)} &= 25W / 52.5V = 0.476A \text{ for LED output 1} \\ \text{Current (A)} &= 25W / 52.5V = 0.476A \text{ for LED output 2} \end{aligned}$$

C. *If you want to stick to 0.7A LED output current and 30 LEDs in total: CHOOSE AN LED DRIVER WITH A DIFFERENT CAPACITY.*

In the SOLOdrive range this would mean choosing a 100W LED driver, which has ample support for the required 73.5W.

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