DC – DC LED Driver Introduction and Application

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LED drivers can be divided into two types: AC-DC LED drivers and DC-DC LED drivers. The AC power source of AC-DC LED drivers is directly connected to the mains, but the DC power source of DC-DC LED drivers can be from an AC to DC power supply or a DC input such as a centralized power supply bus or a battery.

Previously, when high-power LED luminaries were in the early stages of development, the LED chip manufacturing process and materials can readily affect the LED forward voltage difference. Each loop of LED light string will be equipped with a linear constant current source, as indicated in Figure 1, to ensure the current range of each channel for prolonged LED luminary life. In most cases, a constant current source is provided using an linear IC or a DC-DC LED driver. Generally, the constant current source uses a constant current IC or with a DC-DC LED driver. However, with the optimization of the LED process, the reduction of the LED forward voltage difference and the demand for high-efficiency lamps, high-power lamps are mostly “directly driven” as shown in Figure 2. Mobile illumination, solar streetlights, centralized power supply, and other applications are becoming more prevalent for DC-DC LED drivers.

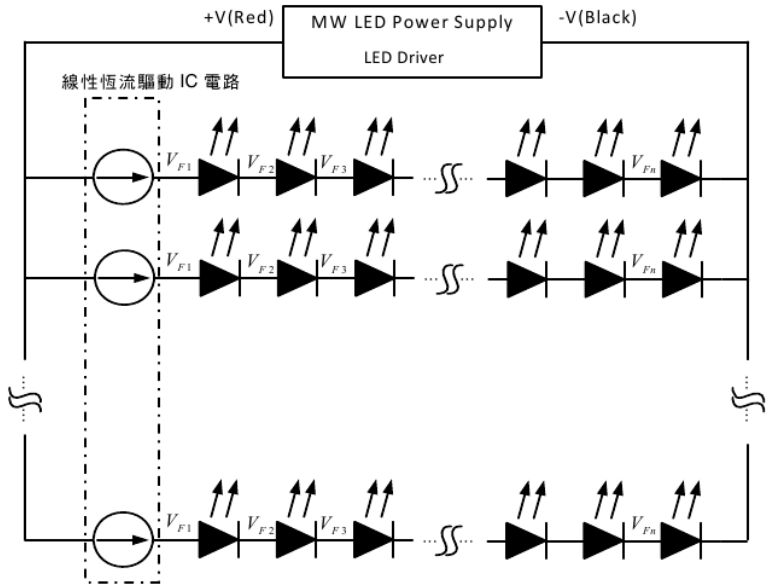

Figure 1. Constant current or constant voltage LED driver with linear LED driver IC

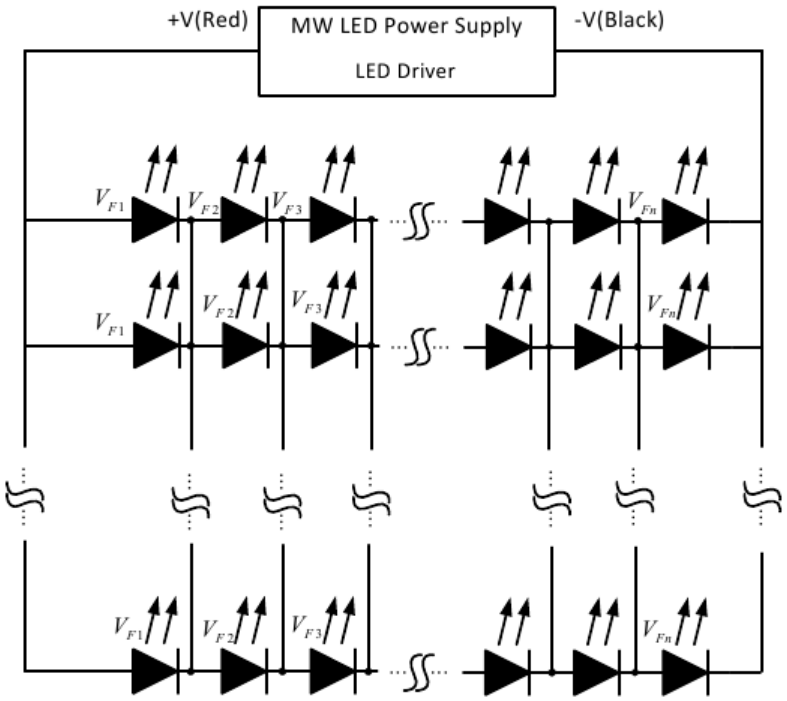

Figure 2. LEDs are driven directly by constant current LED driver

DC - DC LED drivers can be classified into buck, boost and buck-boost according to the structure used. The table below shows the classification and features of MEAN WELL products

Classification	Model	Feature	Appearance
Buck	LDD-L/H(DA) LDDS-H NLDD-H NHDD-40	The driving voltage of the LED light string is lower than the DC supply voltage. It is generally used in centralized power supply lighting applications, such as: 48V power supply magnetic commercial track lights, 24V garden or pool lighting landscape lighting applications.	  

Boost	LDH-25/45(DA)/65	The driving voltage of LED light strings is higher than the DC supply voltage. It is generally used in single-string high-voltage or large-wattage lamps, such as solar streetlight applications, which can be powered by 12V/24V batteries, and then powered by a boosted DC-DC power supply. Thus, the boosted voltage is used for the LED light string to enlarge the range and wattage of the LED driver voltage.	
Buck-boost	LDB-L	It's ideal for low-wattage applications. Regardless of whether the driving voltage of the LED light string is lower or higher than the DC supply voltage.	

Below are two examples of applications in different categories for your reference.

Buck application example:

As environmental awareness and demand for energy savings and carbon reduction develop, electric vehicles and green energy become increasingly widespread. The future power supply trend is expected to be high-voltage DC centralized power distribution. The high-voltage DC power supply busbar is built-in in the room, as illustrated in Figure 3. Models of MEAN WELL power supplies include the UHP-1500-HV and RST-7K5-HV series as well as the 380VDC is the output voltage. Besides providing fast charging for electric vehicles and the operation of various devices in the room, it can be used with the step-down DC-DC LED driver, NHDD-40 series, to drive the lighting fixtures in the room.

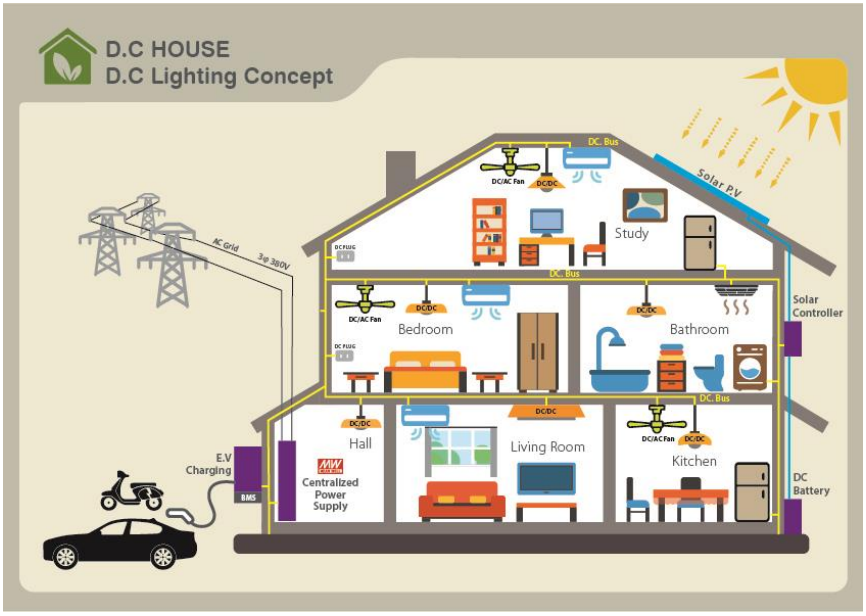

Figure 3. Demonstration of DC house

Boost application example:

Solar energy, which is portrayed as an endless and environmentally friendly new energy, is one of the antidotes to the energy shortage. Currently, many low- and medium-power streetlights use solar energy as the power source. When the power demand for solar streetlights is high, a boost type DC-DC LED driver can be used to increase the number of LEDs in series while decreasing the number of LEDs in parallel. When compared to a buck type DC-DC LED driver, current is reduced, and power loss is minimized as a result. The overall energy efficiency has increased significantly.

As shown in Figure 4, the solar panel charges the battery through the MPPT controller when there is enough sunlight. A low-voltage battery, such as a 12VDC or 24V DC battery, is usually utilized for safety reasons because it has a more stable charging performance. At night, the boost DC-DC LED driver, LDH-25/45(DA)/65, within the lamp can increase the battery voltage by 12V or 24V to supply power for larger wattage solar LED streetlights or mobile LED lighting fixtures. In addition boosted LED drive power can be applied to automobile or ship batteries as a DC-powered source, as shown in Figure 5.

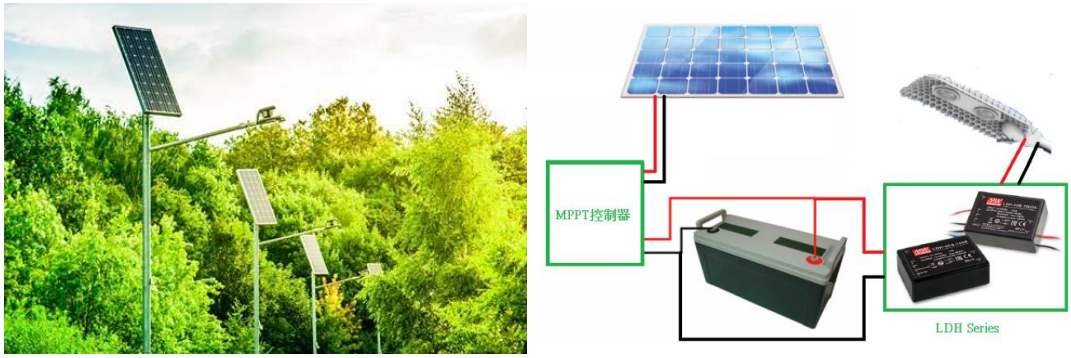

Figure 4. Structure of street lamp with solar system

Figure 5. Application of interior car lights

Reference:

1. Structure of street lamp with the solar system