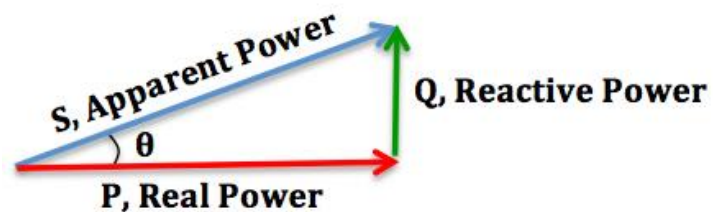


1. **LED Driver** - Electronic equipment that transforms the main supply voltage into a (usually) lower DC voltage that is appropriate for the specific LED light source. Drivers could be internal (built-in) or external. Most of the Lotus LED Lights fixtures come with external drivers as that has the following advantages:
 - Ability to provide different drivers (i.e. 120V or 277V – 347V input, or TRIAC or 0-10V dimmable) for the same fixture
 - In case of driver failure only the driver is replaced, whereas if the driver is internal the whole fixture has to be replaced. As 95% of the failures happen in the LED drivers, replacing only the driver reduces costs and is more environmentally friendly. Also ensures that the light fixtures would be serviceable after production of that model was discontinued.

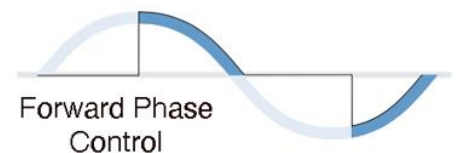
2. **Power Factor** - Ratio of Real (active) power absorbed by the load to the Apparent power flowing in the circuit of an AC electrical power system. A power factor of less than 1 indicates the voltage and current are not in phase, reducing the average product. A load with low power factor draws more current than a load with high power factor for the same amount of useful power transferred. The higher currents increase the energy lost in the distribution system and require larger wires and controls.



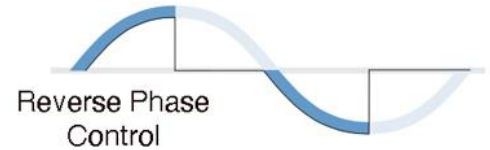
3. **Dimming Methods** - the four main types of dimming are:

3.1. **Phase Cut a.k.a. TRIAC:** (triod for alternating current) **Dimming:** Reducing the power sent to the load by “clipping” part of the sine wave of the alternating current. No control cable is required. Depending which part of the sine wave is cut it is:

- 3.1.1. **Forward-Phase Control** (also called Leading-Edge). Brightness depends on the ratio of “ON” to “OFF” time – the higher the ratio, the brighter the light is. The amount of “OFF” time represents the energy saved by dimming. Best to be used with resistive loads like incandescent and halogen lamps. If the positive and negative periods are equal then it’s safe to be used for dimming inductive MLV (magnetic low voltage) transformers. Generally, the cheapest option for dimming LEDs.



- 3.1.2. **Reverse-Phase Control** (also called Trailing-Edge).
Used for dimming capacitive ELV (electronic low voltage) loads. Like forward-phase, brightness is determined by the “ON” to “OFF” time ratio.
Reverse phase dimmers are usually more expensive but offer better control, smoother dimming to lower levels, generate no or low noise both from the dimmer and the LED driver, and tend to outlast the forward phase dimmers.



Stock drivers that are included with most Lotus LED Lights fixtures are TRIAC dimmable and support both forward and reverse phase controlling.

- 3.2. **0-10V Dimming:** Zero to Ten Volt of the simplest and earliest control methods, performed by a dedicated DC voltage signal that ranges between 0V and 10V. Light is at full brightness when full voltage is passed (10V), and turned off when there is no voltage (0V), and dimmed proportionally based on the voltage level of the control signal.

There are 2 standards of 0-10V dimming:

- 3.2.1. **Current Sourcing:** Used mainly in theatrical lighting, the controller sends the signal to the light fixture. This method is being replaced by the newer DMX512
- 3.2.2. **Current Sinking:** Here the driver provides the signal to the controller and the controller (dimmer) reduces the volts from 10 to 0. At 10V the light would be at full power, and at 0V would be either dimmed to zero or the driver would shut down.

Lotus LED Lights offers 0-10V dimmable drivers as option to most recessed fixtures with external drivers.

- 3.3. **DALI Dimming:** Digital Addressable Lighting Interface (DALI) is a two-way digital lighting control system protocol used in building automation in commercial applications. This is a flexible system with possibility to create separate lighting groups with easy wiring. Established by a consortium of lighting equipment manufacturers as a successor for 1-10 V/0–10 V lighting control systems, and as an open standard alternative to several proprietary protocols.

- 3.4. **DMX Dimming:** Digital Multiplexing (DMX) is a digital signal interface standard that came about due to the more rigorous needs of the theatrical lighting industry. Now increasingly used in architectural and accent lighting applications, it allows for digital communication of individual fixtures using a low voltage control signal. Up to 512 addresses can be using in a single DMX controller.