Line Voltage SnapBrite module Application notes

Line Voltage SnapBrite Modules

SnapBrite AC LED modules are different from traditional DC LED modules in that they are connected directly to the AC line – typically 120, 230 or 277 V AC. A SnapBrite module typically has an internal rectification circuit and a series of LED chains driven through different parts of the AC cycle. This is usually controlled by a dedicated on board processor unit.

A Line Voltage SnapBrite is essentially very simple to use, only requiring direct connection to the AC source. SnapBrite modules do not use (or need) a complex and bulky AC – DC power supply as do DC LEDs. These DC power supplies have a large number of components that can fail in service, take up substantial space and increase fixture profiles, are difficult and expensive to make dimmable and typically display poor power factor and harmonic distortion characteristics.

Connecting a Line Voltage SnapBrite Module

To connect a line voltage SnapBrite module into a circuit is very straightforward. The Module, which has polarity, is connected to the line and return legs of the supply by using the on-board connectors or by soldering to the pads as shown in the appropriate product description. The Module should be properly thermally connected to a heatsink (see paragraph below).

In the case of IDC connectors, the correct insertion tool must be employed, details of which may me obtained from Lynk technical department. Here is a link to the tool and proper use for one of the common IDC connectors used on SnapBrite modules http://datasheets.avx.com/SingleIDCContact_9176-500.pdf. Solder connections made manually, should use SN60 solder with silver content and be applied with a 25W soldering iron at 370°C (698°F) Max – for a period of 3 seconds or less. Care should be taken to avoid contact between the hot soldering iron and the on-board electrical components.

Dimming

Lynk Labs SnapBrite Modules are naturally dimming capable. Some are compatible with Triac and others with 0-10. Please check your data sheet for the dimming capability on the specific SnapBright module. Unless otherwise indicated with a marking on the PCB showing 0-10V, the modules will be phase cut dimmable. They are compatible with a range of commonly available dimmers and more information may be obtained from Lynk technical department. Like electronic transformers, most dimmers have a minimum load. In some cases (trailing edge dimmers) this is very small and presents no issue. For leading edge (Triac based) dimmers the minimum load can be anywhere from 20 to 40 W and is usually stated by the manufacturer. In most cases the LED load must be more than this minimum to make normal, quality dimming and operation possible.

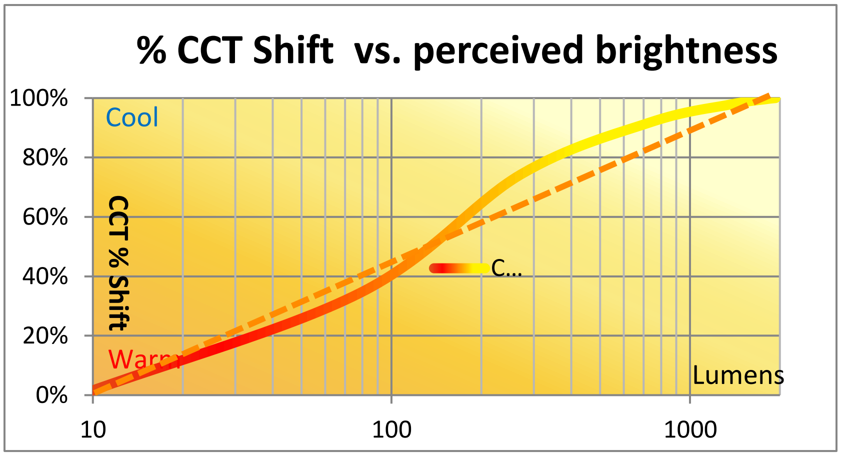
Some modules have been designed to operate using a 0-10V dimming input. This is indicated in the data sheet.

Warm-on-Dim

Unlike other LED light sources, some SnapBrite modules offer a very unique but optional Warm-On-Dim patented feature that can change the Color temperature (CCT) from cooler to warmer as the dimming level changes. This mimics the way a traditional light bulb or halogen lamp becomes warmer to look at as the light level reduces. WOD is a great feature for hospitality and residential applications.

With the other color shift technologies (typically DC based power systems) the user has to set the light level and separately the colour temperature. Off board of the light engine, is an expensive driver with 3 channel constant current output and a (typically DMX) controlled input from the lighting control system. The lighting control system is an additional costly item to install but is not normally considered part of the luminaire cost.

With Warm on Dim, the CCT falls from the higher set point to the lower limit as the (phase cut) dimmer is turned down in brightness. This is a MUCH simpler and low cost way of providing the same warm effect that incandescent and halogen lights display naturally. It's something people have become used to and like – making for a warmer atmosphere as the lighting levels fall.



Lynk's Warm on Dim system is inexpensive and integral to the luminaire (light engine) and fully compatible with the (already installed) phase cut dimmer.

In technical terms, Lynk's patented WOD system exploits the way standard (leading and trailing edge) phase cut dimmers modify the voltage waveform. That in turn leads to a relationship between the dimmer setting (phase angle –typically set by a rotary or linear slider control) and the CCT and brightness. So, as the brightness (lumens) decreases, the CCT gets warmer.

It is important to get the relationship between the brightness and the CCT close to that displayed by halogen (and incandescent) lamps. The eye perceives brightness in a non-linear way – in fact logarithmically. That means a decrease from 1000 lm to 100lm appears about as big as a decrease from 100 to 10lm. Lynk's CCT reduction broadly matches that logarithmic relationship which is the dotted line in the diagram. A typical Halogen lamp will match the dotted line quite closely.

Current color shift drivers are complex and expensive. The number of components is often 2 or 3 times as great as in a simple DC driver. Lynk's simple and robust approach uses less than 10 components of which none are capacitive or hysteretic. This means the Lynk scheme is more reliable, much cheaper and most importantly small enough to be included on most of our light engine modules.

Mechanical attachment and Thermal connection to Heatsink

LEDs create heat in operation – only about one third of the input power is turned into light – the rest into heat. If the heat is not effectively removed, the LEDs will rise in temperature and may eventually fail. Lynk recommends that the case temperature (measured from the thermal test point on the Module) be kept below an absolute maximum of 90°C using an appropriate heat sink and attachment method. Look for the Tc marking on your SnapBrite board.

The correct mechanical attachment of the SnapBrite Module to a suitable heatsink with adequate thermal connection is one of the most critical elements in the design of a luminaire.

The following guidelines should be observed in respect of the heatsink and mechanical attachment:

1. The heatsink should be designed to have free air access to allow convection to remove heat energy.
2. The heatsink needs to have about 20 sq. cm of free convective surface area per watt of input power to the Module. NB. This is an approximate value and a more detailed thermal analysis is strongly recommended.
3. The Module should be mechanically attached to the heatsink so that there are no air gaps or other obstructions to heat flow from the Module to the thermally conductive surface of the heatsink.
4. Acceptable connection methods are screws (using the designated attach holes or tabs on the Module), thermally conductive adhesive tape or a clamp. In the case of metal to metal surface contact – a thermal grease, silicone or epoxy paste or a graphite pad should be used to enhance the thermal conductivity

Line Voltage safety considerations

Connecting and managing line voltage with lighting products is a specialised field and should only be undertaken by suitably qualified electrical engineers and designers. It is critical to design fittings so that live voltage is not allowed to connect or jump to metal surfaces which might be accessible to users. Lynk Labs Modules are designed with the necessary creepage and clearance distances to comply with the regulatory standards for 120V, 230V or 277V systems. Many SnapBright modules are UL8750 recognized and newer modules are Title 24 Compliant. Please see your data sheets for more info. Designers should take particular care to ensure that these standards are maintained in respect of wire connections, solder joints and ancillary components within the fitting. It is a recommended practice to include a fast blow line fuse in the circuit. In many cases the Lynk Module already includes this safety feature, but the user should check the specific data sheet to confirm this. It is also recommended to use a proper secondary surge protection device in your fixture design or installation based on the applications to ensure life and warranty requirements of your end lighting product/fixture.

For technical support please contact:

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