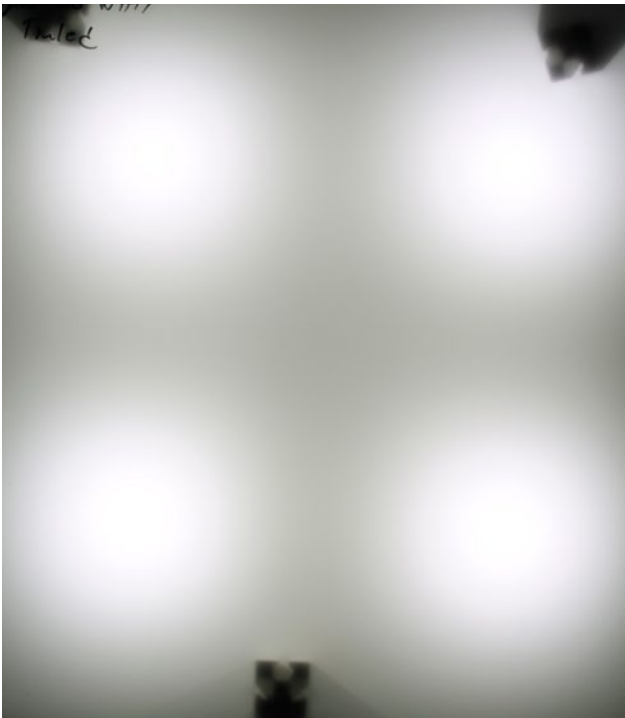


# Direct Backlighting with Kiki-A lenses

Ledil has various optics suitable for direct backlighting, such as the Kiki-A lens used in this application note.

Backlighting lenses are used to increase the spacing of LEDs and/or decrease the amount of LEDs or the thickness of the backlighting luminaire. Backlighting lenses spread the beam heavily from a lambertian LED light distribution to a very wide “batwing” light distribution.

Light uniformity compared only with the Luxeon T LEDs on the left, and coupled with KIKI-A lenses on the right.

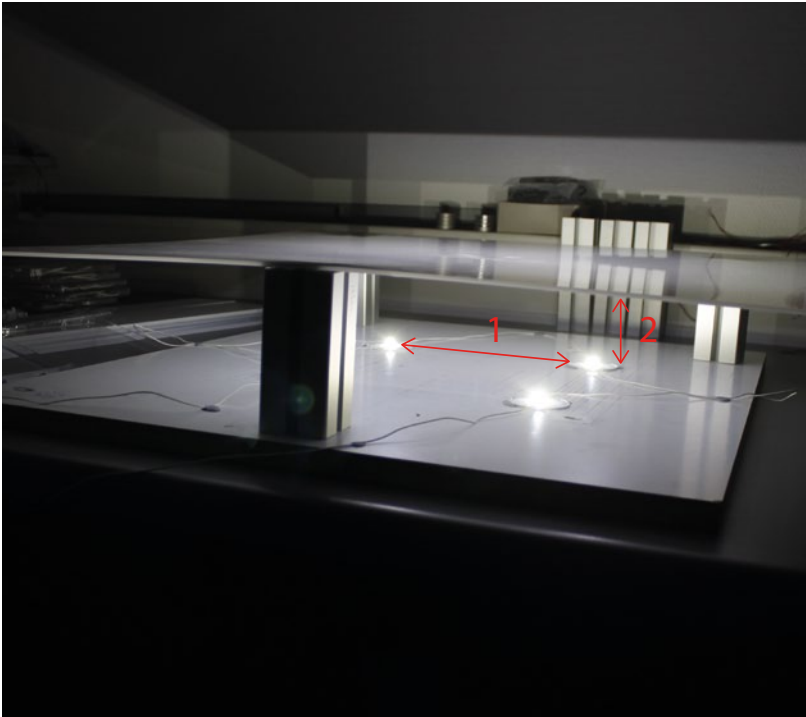


With LED only



With KIKI-A lens

## The right distance



After the LED and lenses are chosen, next step is to find the best distances for the assembly. The height from the PCB to diffuser plate (2) is closely related to the optimal LED spacing (1). Optimal spacing and height eliminates gaps and shadows in light pattern.

If the LED spacing is fixed, height should be adjusted to find uniform result and vice versa.

For more detailed information for your application please contact [techsupport@ledil.com](mailto:techsupport@ledil.com)

## Assembly distance comparison



Distance from PCB to Plexiglas: 100 mm  
Distance between LEDs: 300 mm



Distance from PCB to Plexiglas: 120 mm  
Distance between LEDs: 250 mm



Distance from PCB to Plexiglas: 120 mm  
Distance between LEDs: 200 mm

## Good backlight

### Uniformity and color distortion

70% uniformity is considered to be good enough.

93% uniformity is considered as fully uniform to human eye.

All white color LEDs have more or less color over angle variation, normally the color temperature gets warmer towards wider angles, which in backlighting is typically sensed as darker spot even if the light intensity is the same. The lens can make the color uniformity problems of the LED more visible in some cases, so choosing a suitable LED is of essence.

Light pattern pictures have been taken with digital camera that sees light differently. We always recommend visual prototype testing.

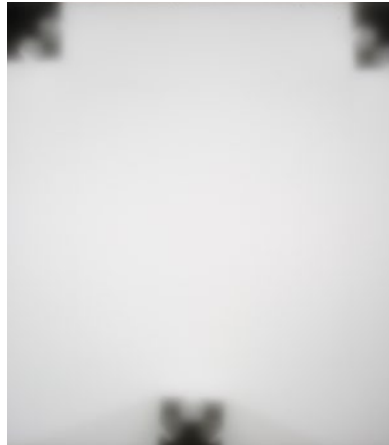


XT-E

### Diffuse plates



**Truled Plexiglas**  
3 mm thick



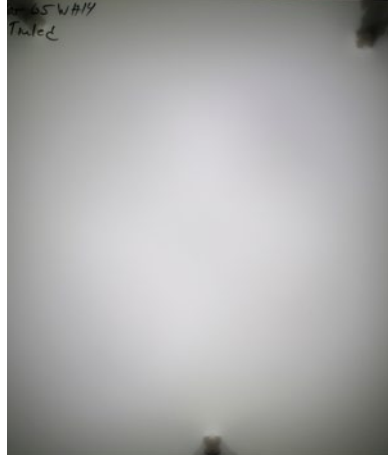
**Diffuser plate**  
5 mm thick

- There are plenty of different types, sizes and shades in diffuse plates to choose from. There are plenty of de-facto diffusers, which are designed for the LED backlights in mind.
- Thicker diffuser plate with more color additives makes the light smoother, but is typically less transparent resulting less efficient light output.

## PCB color



**White PCB**



**Black PCB**

- Backlighting lenses have small amount of reflections from the lens back to PCB.
- The light reflects back from the PCB depending on its color and may have notable influence on the beam pattern and uniformity.
- White PCB reflects more light right above the optic.
- Black PCB reflects less light right above the optic.

## Sides



**No sides**



**White sides**

- White sides around the light sources makes the light to distribute better around every corner.
- Even if the sides are further away from the most center LEDs, the light will still reflect from the edges and make it better looking and more efficient.
- The level of diffusion of the sides has an effect on the uniformity as well. In some cases mirror type of reflection is preferred.
- Color of the sides affects hugely the lighting color as well.

## Use of an installation tape



**With tape**



**No tape**

Even the smallest details, as if the lens is installed with or without tape, can also make difference how the light reacts. Impact isn't as big as in the previous notes, but is still good to keep in mind when choosing the best solution for your needs. KIKI-A is designed so that it can be used both with and without the tape.

The final light pattern comes from many different factors, and all these steps are to be kept in mind when choosing the best solution for your application.

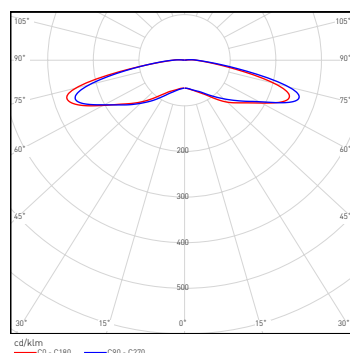
Please do not hesitate to ask for more information or technical guidance from our technical support: [techsupport@ledil.com](mailto:techsupport@ledil.com)

## Optics used

**C13746\_KIKI-A** (without tape)

**CA13747\_KIKI-A** (with installation tape)

- Dimensions: 21.6 x 14 mm
- Height: 5.9 mm
- Typical efficiency: 92%
- Typical FWHM: 162°
- Precision-molded from optical grade PMMA – UL94 HB rated material with operating rating -40°C to +100°C
- Mounts with pins or adhesive tape



**CA13747\_KIKI-A**