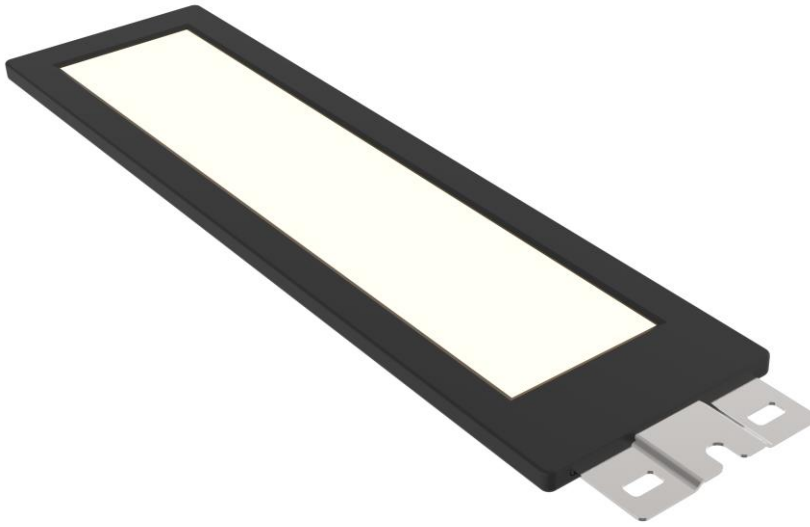


Keuka OLED Lighting Module warm white



The Keuka Module design showcases OLED thinness while simultaneously incorporating an integrated driver which can dim to 5 percent. The innovative system design features an easy to use, versatile socket solution which allows for two different panel insertion orientations so that light can be directed as desired by the end user. The module makes plug and play and simple replacement a reality.

With the Keuka Module, integrators can accelerate product design while maintaining control of the final design, look and feel of their products. The Keuka module uses our Lumiblade OLED panels and will be available at several finishing levels including a sub-assembly option that enables customers to capture the ease of use elements of the module.

The sub-assembly option comes without bezel and back cover to give even more design freedom for integration in different solutions, but still with the same easy plug and play connection system. The Keuka Module family will include several performance and cost options to address a wide range of applications from consumer to professional.

Product features

- Beautiful light: Lumiblade OLED panels as light source
- Easy to use: driver on board
- Simple to integrate: easy plug and play system with socket connector and lampholder

Applications

Every OLED light-application that is commercially viable and easy to implement. Special light application for interior spaces that require beautiful and high performance lighting.

Description

The Keuka OLED Lighting Module is a flat light source. Focusing on general lighting applications, OLEDWorks OLED Lighting is developing products with a high lumen output at low costs for the mid- to long-term future. One significant step in this direction is the range extension of the OLEDWorks Keuka OLED Lighting Module which are available in two different integration levels.

Introduction

OLED is a large-area diffuse light source. Unlike incandescent bulbs, which generate light by passing electricity through a wire, or fluorescent lamps, which pass current through a gas, OLED lighting works by passing electricity through one or more extremely thin layers of organic semiconductor material. These layers are sandwiched between one positively and one negatively charged electrode. The 'sandwich' is placed on a sheet of glass or other transparent material known as the substrate. The OLED is protected by a thin-film encapsulation and a flat heat spreader on the rear side. When current is applied to the electrodes, they inject positively and negatively charged holes and electrons. They recombine in the organic layer of the sandwich and create a brief, high-energy state called 'exciton'. As this layer returns to its original stable, non-excited state, the energy flows evenly through the organic film causing it to emit light. Now, with the ambition of entering large-scale markets with highly sophisticated, standardized lighting technology, these products are defined around value propositions of the predominant markets and the market needs within the relevant applications.

In contrast to the other OLED products of OLEDWorks like the OLED Panel Brite FL300 family the Keuka Module brings for the first time the OLED lighting experience closer to the end-user by combining the panel and the driver in one product. As part of its ongoing product improvement, OLEDWorks will continue to develop the Keuka Modules to higher levels of performance in different shapes and sizes.

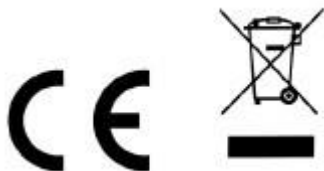
This document refers to

| Product | Product code |
|--|-----------------|
| <i>Keuka Module Subassembly</i> | OMKI300R1WWL501 |
| <i>Keuka Module ww black anodized can, black bezel</i> | OMKI300R1WWL601 |
| <i>Keuka Module ww clear anodized can, black bezel</i> | OMKI300R1WWL602 |
| <i>Keuka Module Lampholder (complete)</i> | OSKI300R1WWL601 |
| <i>Keuka Module Lampholder (for integration)</i> | OSKI300R1WWL602 |

Standard compliance and sustainability

OLEDWorks products are environmentally friendly and provide efficient illumination without the use of hazardous materials.

This product is RoHS (EU Directive 2011/65/EU) compliant.



This product is compliant with IEC 62868, IEC 60838-1, IEC 61347-1, IEC 61347-2-13, EN 55015, EN 61547, EN 62493.

This product is compliant with UL8752. This product is UL recognized in file E353273.



Within the UL report certain 'Conditions of Acceptability' are mentioned as follows. When installed in the end product, the following shall be taken into consideration:

1. These products have been evaluated for connection to an isolated DC Class 2 constant current power source.
2. This product has been evaluated for use in dry or damp locations.
3. The OLED panel temperature shall not exceed 80 °C.
4. Input leads to the OLEDs are intended for factory installation only. Strain relief to be considered in the end-use application if leads are subjected to mechanical stress.
5. Input leads to the OLED panels shall be sufficiently separated from higher voltage conductors in the end-product in compliance with end-product requirements.

System



Figure 1: Keuka OLED Lighting Module inkl. Lampholder

| | Description | Remark |
|--------------------|---|---|
| Indoor / outdoor | Indoor buildings | location with insignificant shock and vibration |
| Ingress protection | | not applicable for OLED components |
| Classification | Applicable in applications with Class III protection | Application standard IEC61140 |
| OLED color | White | |
| Carrier material | Glass | |
| Driver inside | Driver inside | |
| Connector | Easy plug and play with prong on the module and separate Lampholder | See detailed description below |
| RoHS conform | Yes | 2011/65/EU |

ENVIRONMENTAL

Operational environmental conditions*

| Specification item | Value | Unit | Condition |
|--|------------|------|---|
| Ambient temperature | +5 ... +40 | °C | |
| Relative humidity | 20 ... 80 | %rH | no dew, no water spray, a maximum %rH of 60 is recommended. |
| Recommended internal operation temperature (temperature of OLED emission side) | ≤ 50 | °C | local temperature |
| Maximum internal operation temperature (temperature of OLED emission side) | ≤ 80 | °C | local temperature, for t > 50 °C lifetime will be reduced. |

* please refer to Thermal Characteristics on page 24 for more information.

The Keuka Module is designed for indoor use only. Do not expose to water or excessive moisture.

Storage and transport conditions*¹

| Specification item | Value | Unit | Condition |
|---------------------|-------------|------|------------------------|
| Ambient temperature | -40 ... +60 | °C | |
| Relative humidity | 5 ... 85 | %rH | no dew, no water spray |

*¹ Recommended storage temperature is between 15 ... 25 °C with a humidity < 65 %rH.

MECHANICAL DIMENSIONS

| Specification item | | Value | Unit | Condition |
|--------------------------|--------------|------------|------|-----------|
| Keuka Module subassembly | length | 280.5 | mm | |
| | width | 65.9 | mm | |
| | height | 4.2 | mm | |
| | weight | 94.5 ±0.5 | gram | |
| Keuka Module with cover | length | 282.5 | mm | |
| | width | 69 | mm | |
| | height | 6 | mm | |
| | Prong length | 21 | mm | |
| | Prong width | 54.5 | mm | |
| | weight | 154.0 ±0.8 | gram | |
| Lampholder | length | 32 +9 | mm | |
| | width | 62.5 | mm | |
| | height | 4 | mm | |
| | weight | 31 | gram | |
| lit area | width | 221 | mm | |
| | height | 45 | mm | |

Diagrams of the Keuka Module Subassembly and Lampholder

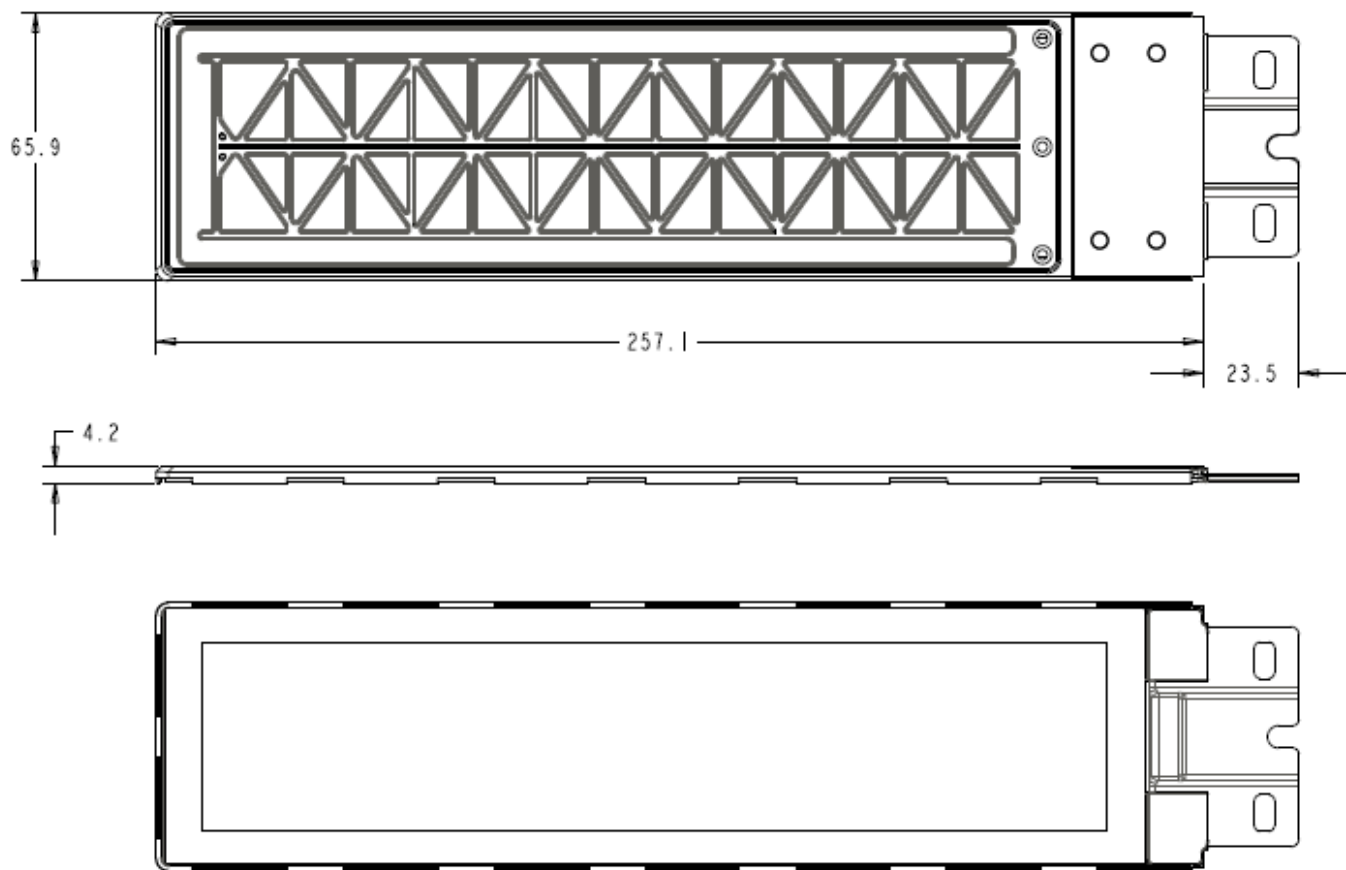


Figure 2: Keuka Module Subassembly (front, side and back view)

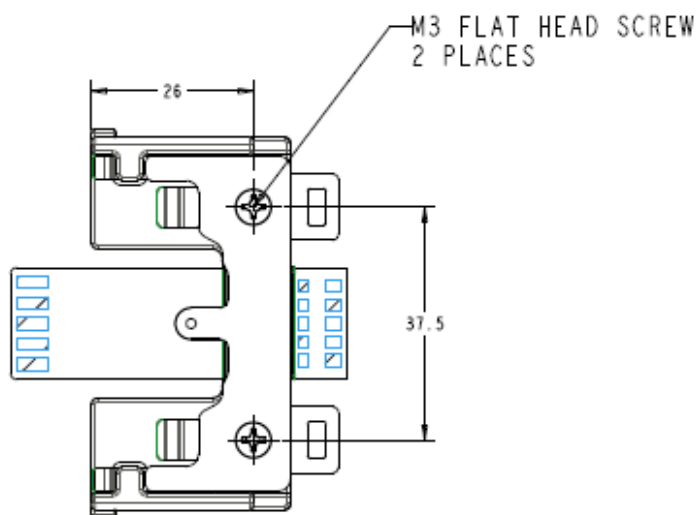


Figure 3: Lampholder complete

Diagrams of the Keuka Module with cover

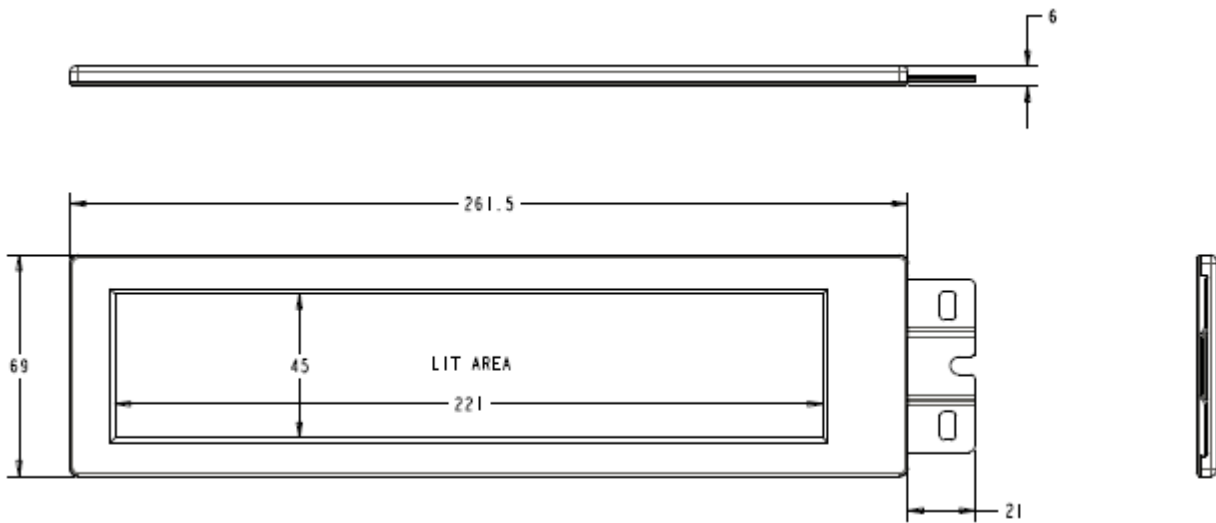


Figure 4: Keuka Module – front and side view

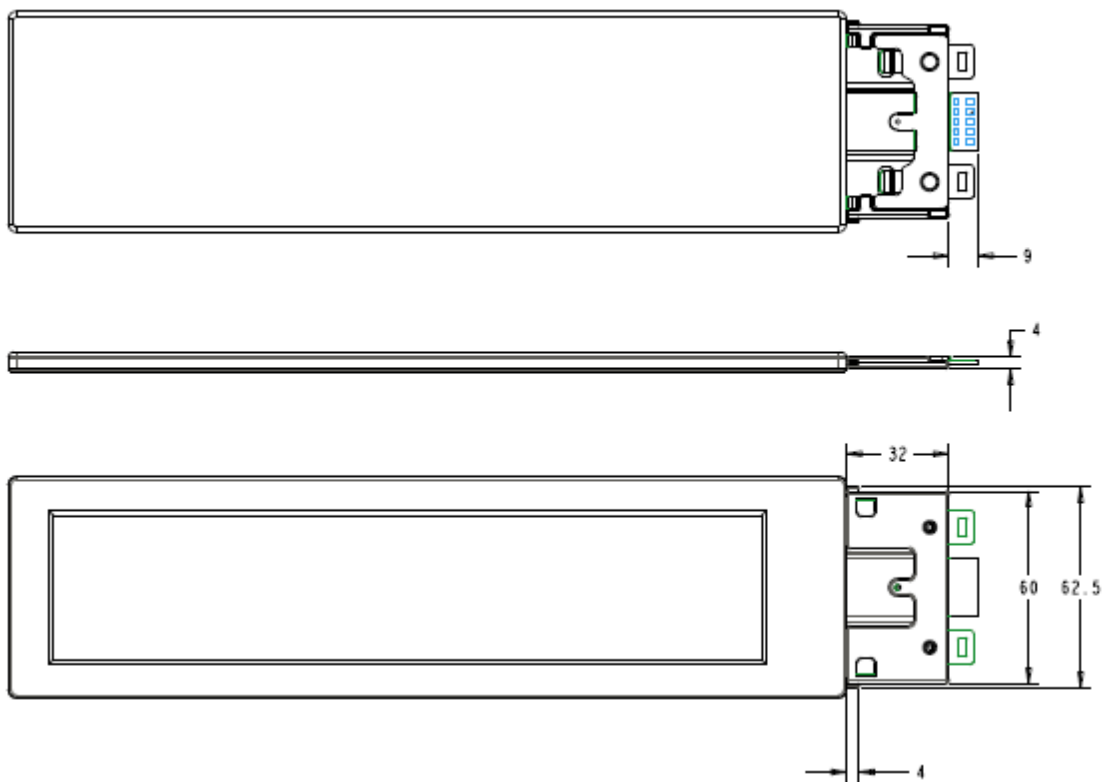


Figure 5: Keuka Module complete with Lampholder

Mechanical handling

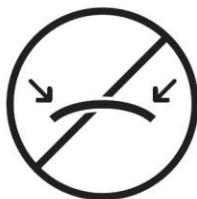
OLEDs are electronic components and should not be tampered with in any way. They are made of thin glass with potentially sharp edges. Avoid mechanical stress, such as shock, pressure, bending, torsion and especially point loads on the OLED. To avoid fingerprints on the front side, preferably handle the OLED from the sides. Gloves or finger cots are recommended at all times whilst handling the OLED.

Avoid contact with water. Do not submerge OLEDs in any kind of solvent, acid, base, salt or other chemicals.

In case of damage to the product, disconnect the product from power supply without touching the damaged parts. Do not reconnect the product. Contact the manufacturer or a qualified service technician.

Improper use can cause OLEDs to break resulting in glass splinters. Please handle all OLEDs with care to avoid breakage as especially the edges of the OLED are very delicate. Use of protective gloves is advised, in particular with broken OLEDs or OLEDs with sharp edges/corners. Avoid direct contact with broken OLEDs.

The product may become warm during normal use. Do not cover with materials that are flammable.



Do not bend



Do not twist



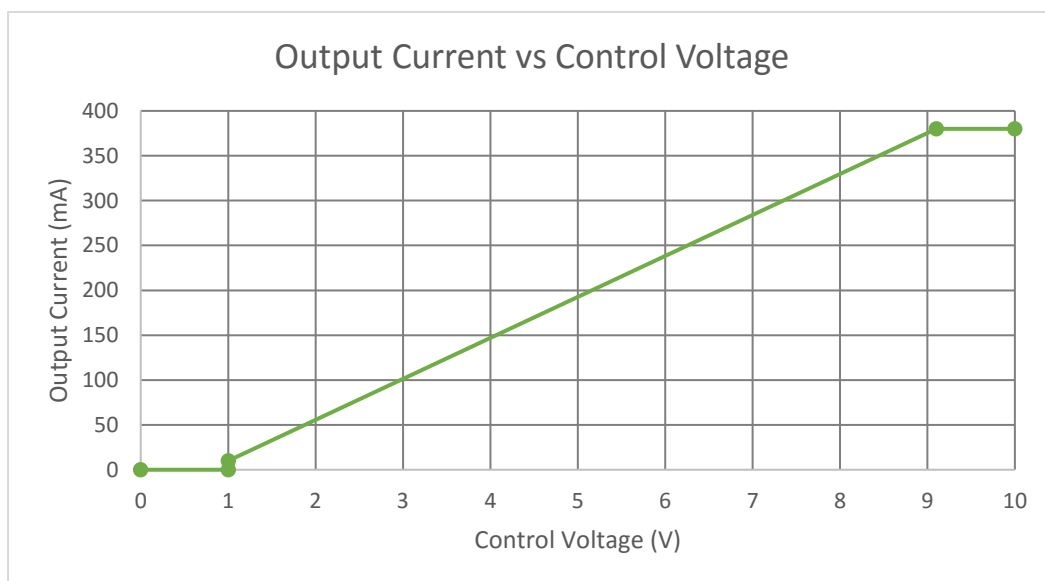
Do not press

ELECTRICAL AND OPTICAL CHARACTERISTICS - OLED

Electrical characteristics

| Specification item | Value | Unit | Condition |
|--|--------------------|------|------------------------|
| OLED rated current, $I_{in \text{ rated}}$ | 0.368 | A | |
| OLED voltage at $t=0$, U_{in} | $20.0 + 0.5/- 1.0$ | V DC | $I_{in \text{ rated}}$ |

All data nominal at stabilized conditions after 5 min warm-up, $T_{\text{organic}} = 50 \text{ }^{\circ}\text{C}$.



Dimming

Both pulse width modulation (PWM) and amplitude modulation (AM) techniques can be used to dim the OLED. More detailed information can be found in the design-in guide for the Brite FL300 family.

Keuka connection

The Keuka module is designed for easy connection with the male PCB for power connection and Lampholder parts for mechanical stability.

For the electrical connection, the male PCB board is designed with 5 pads, shown in blue in Figure 6, to connect with wires and 5 more pads on opposite end to connect with spring fingers in the module. The board is designed to be reversible on the module end, having pads on both sides of the board. This allows the module to be inserted into the Lampholder facing either direction and it will have the correct electrical connection.

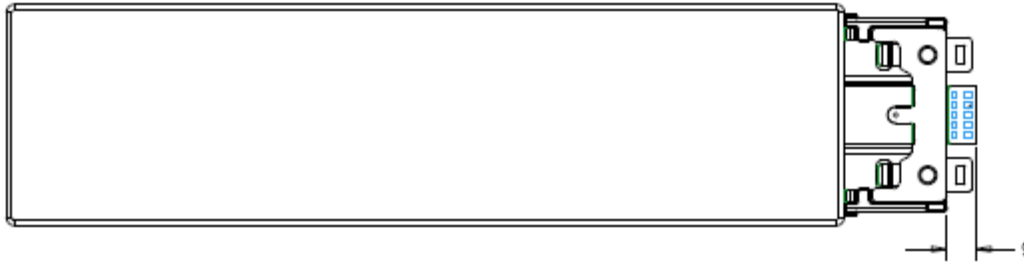


Figure 6: Keuka Module complete with Lampholder

Figure 7 shows an internal layer of the male PCB connections. The top 3 pads, on the left in Figure 7, are the required for operation of the Keuka module. As marked: GND is ground wire connection, 24V is the 24V source connection, CON is the control line connection (example: 0-10V dimmer). X and Y are not used for the current Keuka module.

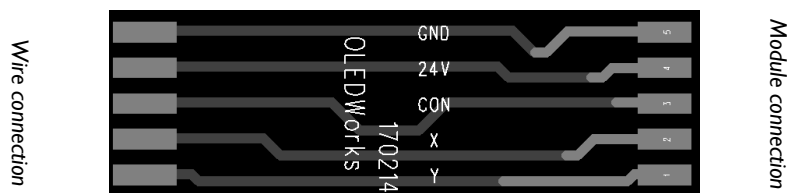


Figure 7: Contact pads of the Keuka Module Lampholder

Short circuit behavior

If an OLED fails it can fall into a short circuit. Such a condition may mean that

- no light is generated
- the OLED is heated locally, i.e. one small spot of the OLED surface gets hot
- the current still flows through the OLED but the voltage drops to a lower value.

In case such a fault occurs, the OLED will be switched off by the integrated driver electronics.

Optical characteristics Keuka Module ww*2

| Specification item | Value | Unit | Condition |
|------------------------------------|---------------|-------------------|--|
| Luminance, nominal | 8300 | cd/m ² | @ I _{in rated} = 0.368 A, perpendicular, center |
| | 3150 | | @ 0.135 A, perpendicular, center |
| Luminous flux | 300 ± 10 % | lm | @ I _{in rated} = 0.368 A with L70B50 = 10khrs |
| | 115 ± 10 % | | @ 0.135 A with L70B50 = 50khrs |
| Luminous efficacy, nominal | 38 | lm/W | @ I _{in rated} = 0.368 A |
| | 42 | | @ 0.135 A |
| Color | White | | |
| Chromaticity x, nominal | 0.4415 | | integral measurement, CIE 1931 |
| Chromaticity y, nominal | 0.4016 | | |
| Chromaticity u', nominal | 0.2546 | | integral measurement, CIE 1976 |
| Chromaticity v', nominal | 0.5211 | | |
| Duv | -0.0016 | | center of color box with respect to BBL |
| Color spec limits CIE xy | 0.4290 0.3934 | | corner coordinates of area in colorspace |
| | 0.4490 0.3997 | | |
| | 0.4544 0.4097 | | |
| | 0.4337 0.4034 | | |
| Color spec limits CIE u'v' | 0.2500 0.5159 | | corner coordinates of area in colorspace |
| | 0.2604 0.5215 | | |
| | 0.2594 0.5262 | | |
| | 0.2488 0.5206 | | |
| CCT | 2,900 | K | @ I _{in rated} = 0.368 A |
| Color Rendering Index: CRI / R9 | 80 / 0 | | @ I _{in rated} = 0.368 A |
| color instability over angle (CSF) | ≤ 0.004 | | 0 .. 75°, Δ=5°, T _a = RT, I = 0.368 A |
| Homogeneity | ≥ 80% | | 9 point measurement, min/max, I _{in rated} = 0.368 A |

*2 all data for stabilized electrical conditions of the device after 5 min warm-up period, integration level 1.

OLED spectrum

Typical spectra of the OLED at different driving currents are given in Figure 15.

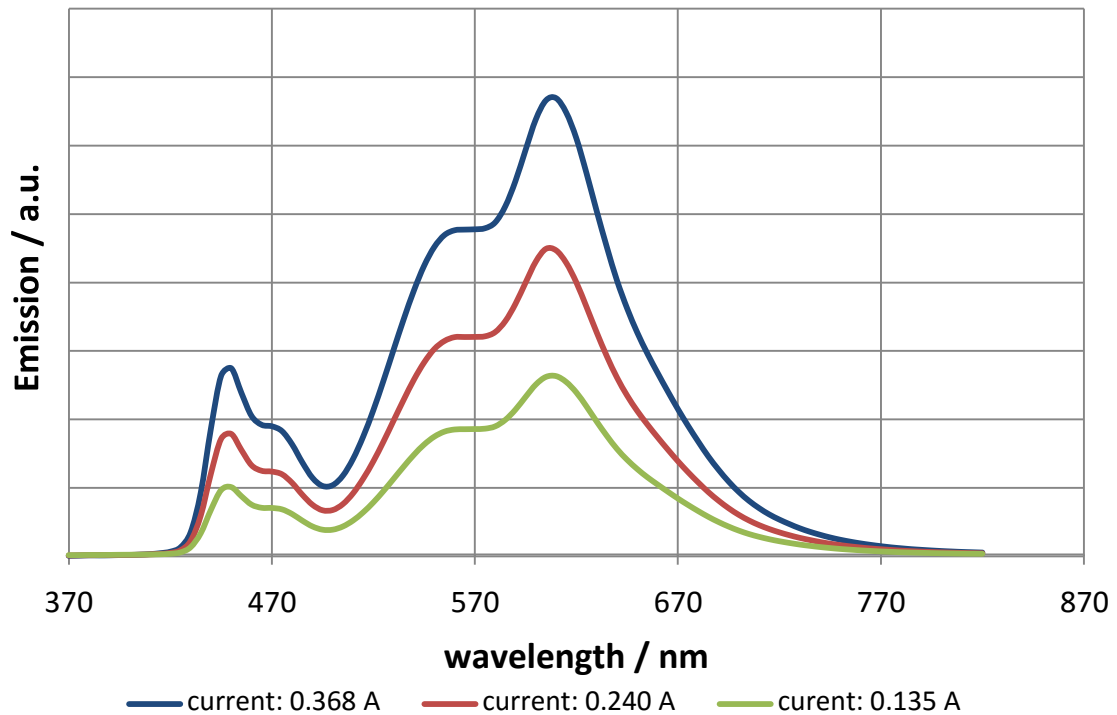


Figure 11: typical emission spectra of the Brite FL300 L ww at different driving currents ($I = 0.135 \text{ A}, 0.240 \text{ A}, 0.368 \text{ A}$)

Current – voltage – luminance characteristics

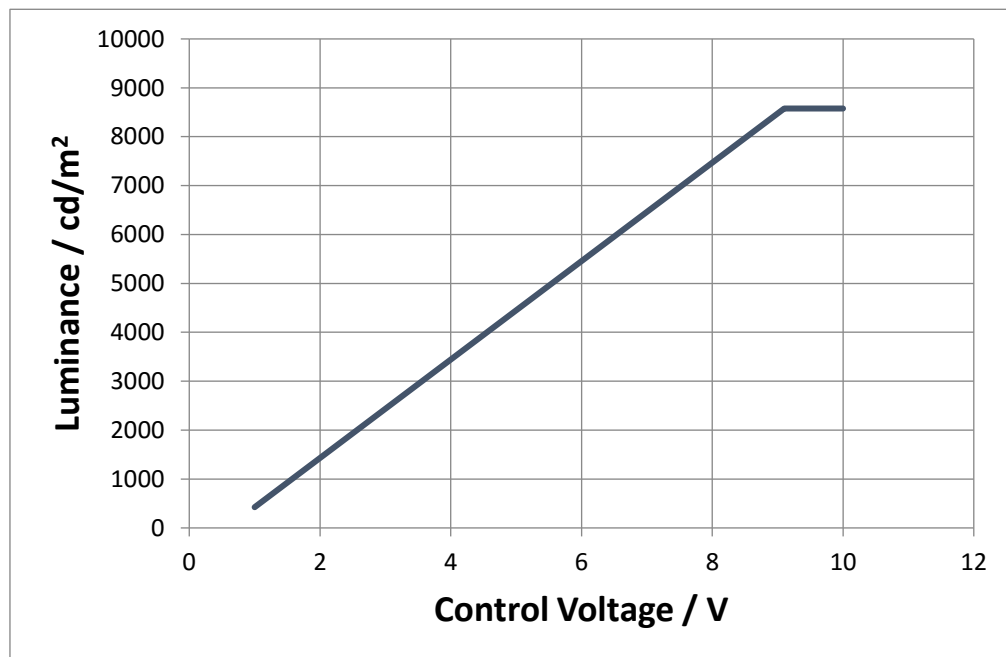


Figure 12: Luminance versus control voltage at room temperature

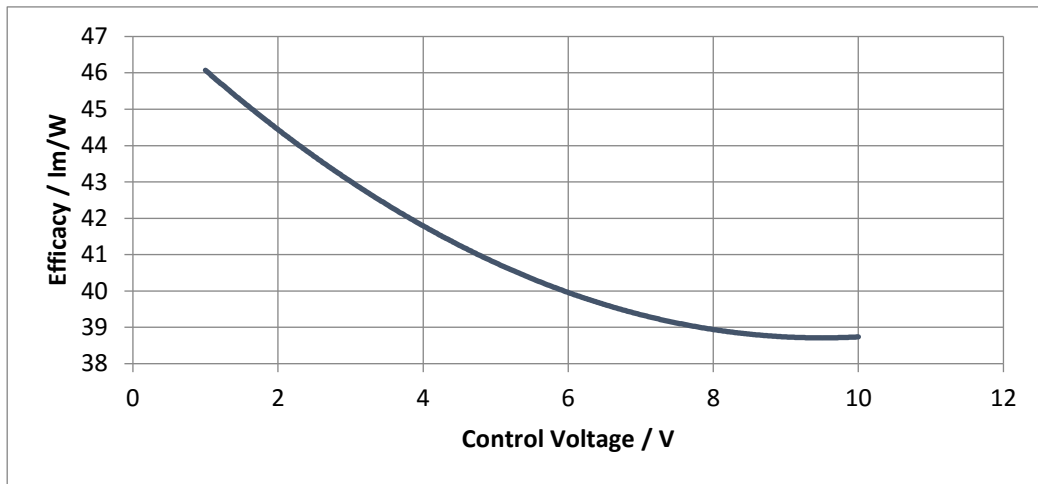


Figure 14: Luminous flux vs control voltage

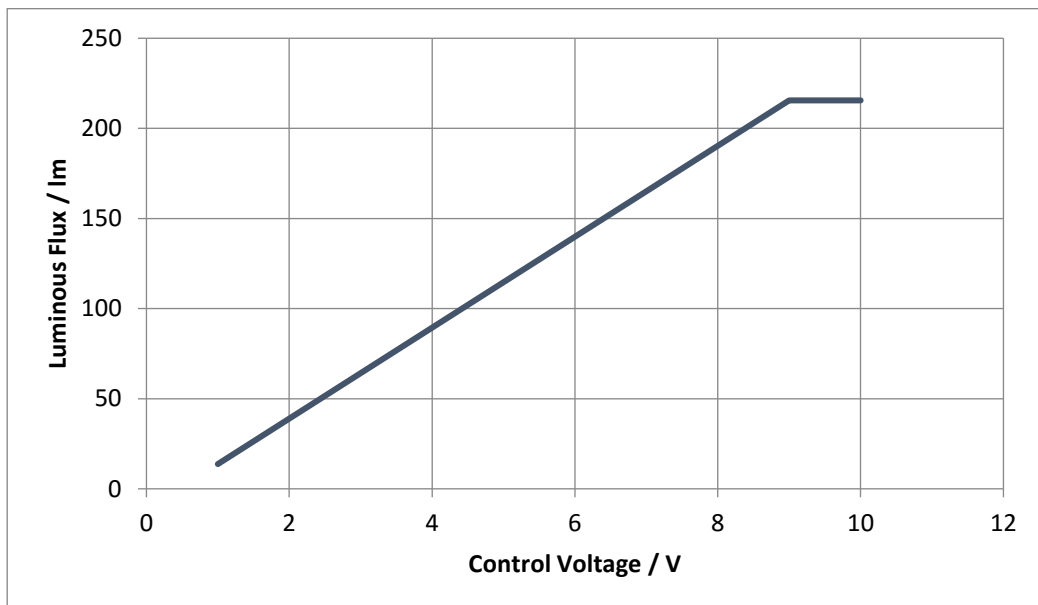


Figure 15: Efficacy versus control voltage

Homogeneity of optical parameters

The Keuka Module is a large area device and the luminance value may depend on the location within the active area. A very small color point distribution may also be observed: Typical values for a bare OLED at rated current and room temperature are $\Delta CIE_x \approx 0.0012$, $\Delta CIE_y \approx 0.0009$ ($\Delta CIE_u' \approx 0.0016$, $\Delta CIE_v' \approx 0.0005$).

THERMAL CHARACTERISTICS

OLEDs can generate a certain amount of heat. Despite the fact that no active cooling is required, the panels should not be covered in order to avoid heat accumulation.

The OLED temperature during operation depends on ambient conditions and driving current. Indicative values for internal (organics) temperature of the device can be measured at the glass surface at the center of the device with a thermocouple attached.

Typical temperature for the Keuka Module is $\approx 50\text{ }^{\circ}\text{C}$ with the following set-up:

- $T_{\text{ambient}} = RT = 25\text{ }^{\circ}\text{C}$
- vertical orientation
- climate chamber, no active convection.

Lifetime

Luminous flux reduces with lifetime of the OLED. The luminous flux of the Keuka Module decreases to approximately 70% after 10,000 hours at rated current.

| Specification item | Value | Luminous flux | Condition |
|----------------------------|--------------|---------------|--|
| OLED Panel Lifetime L70B50 | 10,000 hours | 300lm | @ $I_{\text{in rated}} = 0.368\text{ A}$, $T_{\text{organic}} = 52\text{ }^{\circ}\text{C}$ |
| OLED Panel Lifetime L70B50 | 50,000 hours | 115lm | @ 0.135 A , $T_{\text{organic}} = 35\text{ }^{\circ}\text{C}$ |

Voltage increases over lifetime of the OLED; color and homogeneity of the panel may also change.

General handling recommendations and care

Cleaning

Please avoid scratching the front side with any hard or sharp objects. OLEDs can be cleaned with any soft textile. If required use a damp cloth but avoid extensive moisture.

Use of a compressed air spray to remove regular dust from the individual panels is advised for everyday cleaning. Should fingerprints or more persistent contamination occur, isopropanol applied to a lint-free cloth can be used to gently clean the surface of the OLED. Clean using circular movements beginning at the center of the OLED and moving outwards towards the edges. Contact with water is to be avoided.

Storage and operating

Please note that the recommended storage temperature is $15\text{ }^{\circ}\text{C}$ to $25\text{ }^{\circ}\text{C}$. The recommended relative storage humidity is 65% or lower. Avoid exposing OLEDs to UV light.

Safety

Please be careful when handling OLEDs. The edges of the OLED panels may be sharp and can chip or break. In the unlikely event that an OLED fails, the temperature may rise locally to high levels. To avoid this the OLED should be turned off immediately.

Disposal

OLEDs should be disposed of according to local legislation.

Logistical data

| Specification item | Value |
|--------------------|--------------------------|
| Product name | Keuka Module Subassembly |
| Order code | OMK I 300R I WWL50 I |
| Pieces per box | 1 |

| Specification item | Value |
|--------------------|--|
| Product name | Keuka Module ww, Black anodized can, black bezel |
| Order code | OMK I 300R I WWL60 I |
| Pieces per box | 1 |

| Specification item | Value |
|--------------------|--|
| Product name | Keuka Module ww, Clear anodized can, black bezel |
| Order code | OMK I 300R I WWL602 |
| Pieces per box | 1 |

| Specification item | Value |
|--------------------|------------------------------------|
| Product name | Keuka Module Lampholder (complete) |
| Order code | OSK I 300R I WWL60 I |
| Pieces per box | 1 |

| Specification item | Value |
|--------------------|---|
| Product name | Keuka Module Lampholder (for integration) |
| Order code | OSK I 300R I WWL602 |
| Pieces per box | 1 |

Contact:

OLEDWorks LLC
1645 Lyell Avenue, Suite 140
Rochester, NY 14606, USA

OLEDWorks GmbH
Philipsstr. 8, 52068 Aachen, Germany

OWinfo@oledworks.com

For more information visit:
www.oledworks.com
www.facebook.com/oledworks
www.twitter.com/oledworks

© 2017 OLEDWorks LLC
All rights reserved. Correct as of August 2017.