



# DimIn

## IoT Integration and control module for LED Modules



*Compact integration and control module for wireless Casambi and wire DALI technology that can be integrated into all OptoDrive 230VAC IOT LED Modules.*

***No driver is required!***



## Key features








### IoT area for Smart Lighting

Many wired and wireless protocols are available today and OEMs must consider several factors before deciding the optimal protocol that suits the needs of the end application. Wired protocols offer reliable performance and greater control. However, the cost of wiring and installation can be high especially in commercial settings.

*Compact integration and control module for wireless Casambi and wired DALI technology that can be integrated into all OptoDrive 230VAC IOT LED Modules. The control module communicates with 8 or 10kHz PWM frequency depending on the application.*

### Product areas

Project Market: Hotels and Restaurants

Platform	Table- or freestanding light 	Downlight 	Spotlight 	Pendent 	Medium size Opaque glass 	Medium size Opaque glass HCL/TW 	Big size Opaque glass 
Lilly80 AC IoT	X	X		X	X		
ADA AC IoT	X	X	X	X			
Sanna158 IoT	X			X	X		
Sanna158 AC IoT HCL				X		X	
Sanna290 IoT				X			X

In this area we see an increase of interests for wireless and DALI. We can also see an extreme interest in the area of developing new table and standalone light fixtures with integrated dimmers (Dimin Pot).

#### Special lighting Market: Ship

There are coming new demands and we see interest especially in the sector of flickerfree for Downlight with DALI and built in dimmers (DimIn Pot) for Table and freestanding light fixtures. Very similar to the Hotels and restaurant market.

#### Special lighting Market: Industrial

There are demands for built in dimmers (DimIn Pot) for Table and freestanding light fixtures.

#### Special lighting Market: Horticulture

There are demands coming up for our Sanna with DALI or Casambi due to the standard solutions with Sunlike LEDs on it. It can then easily be integrated with the setup of automatic dimmer solutions for the Horticulture growth of plants.



# DimIn Control Module

Document no:  
n/a

Revision:  
1.2

Page:  
Page 3 of 21

Object:  
Datasheet DimIn

Author:  
SL

Date:  
2022-08-30

## Content

---

Article number structure .....	9
Ordering data .....	9
Wire connection .....	10
ECO System provided .....	13
Dimensions DimIn Module .....	15
Technologies.....	16
DimIn Connectivity Connector Specification.....	17
Verification of Conformity.....	18
Light fitting routine tests .....	18
Precautions for use.....	19
ROHS III Compliant .....	20



## Product areas

Project Market: Hotels and Restaurants

Platform	Table- or freestanding light	Downlight	Spotlight	Pendent	Medium size Opaque glass	Medium size Opaque glass HCL/TW	Big size Opaque glass
Lilly80 AC IoT	X	X		X	X		
ADA60 AC IoT	X	X	X		X		
ADA AC IoT	X	X	X	X			
Sanna158 IoT	X			X	X		
Sanna158 AC IoT HCL				X		X	
Sanna290 IoT				X			X

## Smart lighting

The LED modules have Casambi, DALI, DALI DT8 or an internal protocol (for internal dimming). We have designed this so that the small and medium-sized customers can integrate this in a very simple process. They will be able to use our standard solutions and decide for themselves what they want to do extra if it is DALI, Casambi or other additions they want to make. It is very simple and goes hand in hand with the new EU directives for circular economy.

## Technical description

### Connections

Platform	DimIn Pot	DimIn DALI	DimIn DALI DT8	DimIn Casambi	DimIn BLE versions
Connections	Mains plus 2 wires to a Potentiometer	Mains plus 2 wires to DALI	Mains plus 2 wires to DALI	Mains	Mains
Accessories	Potentiometer for Light fitting				

## Flicker measurements

We have performed flicker measurements on our devices with the IoT interface that you will get on our devices by ADA, Sanna158 and Sanna290. When DALI, Internal dimming or wireless is connected, we get the following values as worst scenario. Normally the values of 6-7% are regular at 100% but the ratio is largely linear between the different dimming intensities.

Intensity	Flicker index	Flicker Percent
100%	0,0317	7 %
50%	0,0373	9 %
20%	0,0374	10 %
5%	0,0320	11 %



## Connectivity Type

### DALI

Our DALI system is bus driven. This means that all DALI devices get their processing power from the DALI bus. Therefore, it is necessary to think about how much energy you extract from the DALI bus in larger installations. Below you can read more about this purely technically, but generally you can manage at least 67 devices that turn on and off at the same time and if they are managed with different scenarios, then up to 125 devices apply.

If we then count on the DALI Bus being powered with 16V and 250mA power supply and remove 20%, we have 200mA to use.  $200\text{mA}/1.6\text{mA}$  means that you can use the energy for 125 DALI nodes or in the worst case  $250\text{mA}/3.7\text{mA}$  applies to 67 Dali nodes. Then you will still want to divide the DALI bus into several branches to achieve the best possible accessibility and cabling.

## Basis of calculation

Normally, we specify the energy demand in milliamps (mA), a unit that indicates the energy demand from the DALI bus.

If you look at the worst case (quite unrealistic):  $V_{BUS} = 9.5\text{V}$ , each node draws 2.6mA in self-consumption, if we maximize the processor communication it draws 6.5mA.

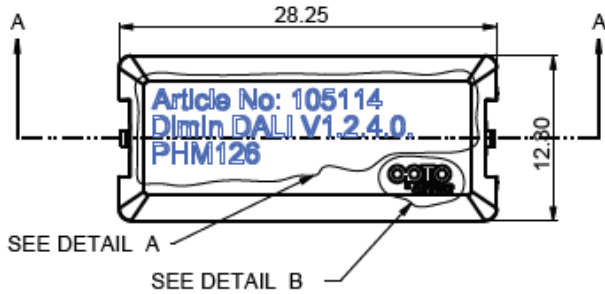
At 16V nominal system voltage, it draws in self-consumption 1.6mA, and with maximum communication 3.7mA.

At 20V, the own consumption is 1.4mA and the maximum consumption is 3.1mA.

Then you have to calculate backwards based on what the current DALI master can provide in current, and be a little conservative and derate this by 20%.

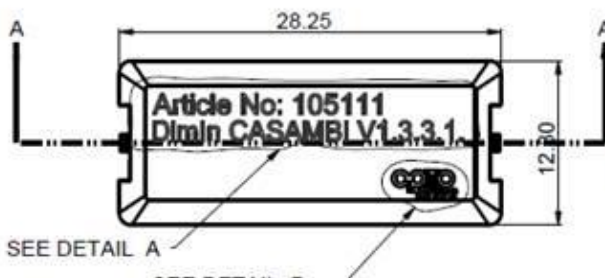
## Marking

### DimIn DALI

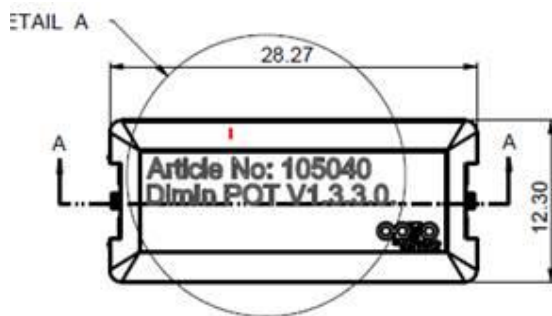


PHM stands for Physical Minimum Level where we now have 126 as standard. PHM 1 is also an option that can also be ordered. PHM126 is such that the end customer can not set a value lower than 3% (PHM126) or 0.1% (PHM1).

### DimIn Casambi

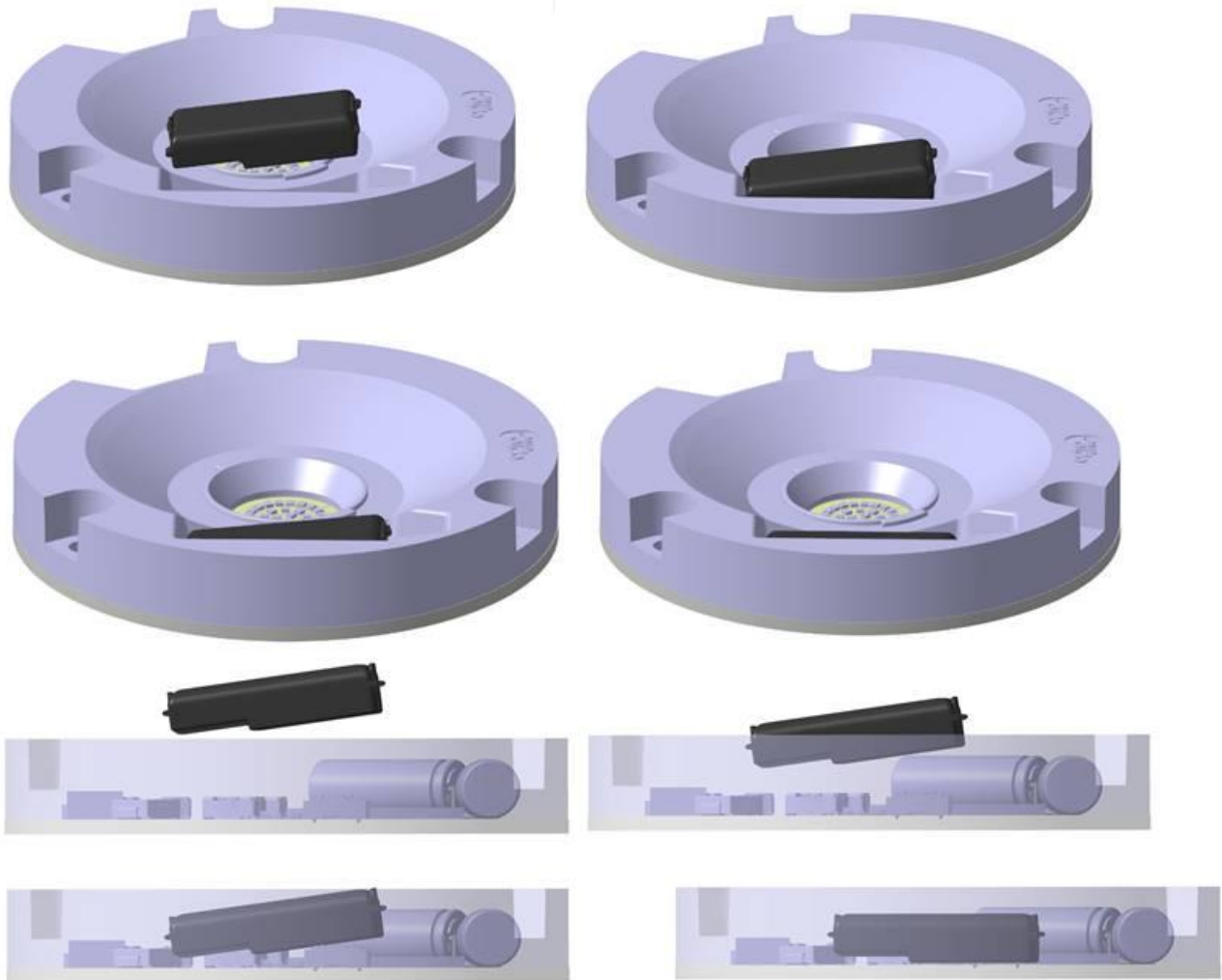


### DimIn POT



## Mounting

This is how it is mounted in the LED module. It can then be integrated into the holder itself without affecting the appearance shape or functionality from the light seen. All of these function modules are contacted against the same connector (interface).



The image description above is on LED modules with IoT where the high voltage driver is integrated directly into the LED module. Therefore, no external voltage adapters are required and the LED module can be directly connected to the mains.

The LED module is equipped with a connection unit where the various functional modules can easily be connected. If no function module is connected, the LED module functions as normal (normal mode) and can be dimmed by a normal dimmer otherwise it is controlled via the function module.



# DimIn Control Module

Document no:  
n/a

Revision:  
1.2

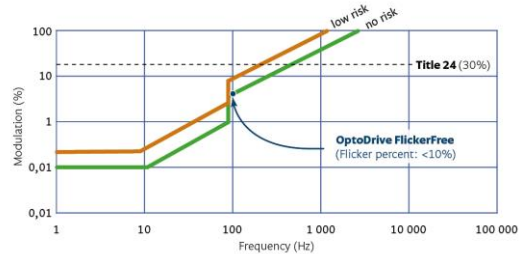
Page:  
Page 8 of 21

Object:  
Datasheet DimIn

Author:  
SL

Date:  
2022-08-30

When the functional module regulates the unit, we tentatively meet the new Eco-Design directive's flicker requirements 2024 (SVM) throughout the dimming sequence, which we do not do otherwise. The LED module is designed to meet the regulatory requirements for electrical connections. Furthermore, the various function modules are designed so that they can be connected to the LED module by the luminaire manufacturer. By installing the functional module in place on the customer's light fitting or even with the end customer, different functionality and possibilities can be achieved.





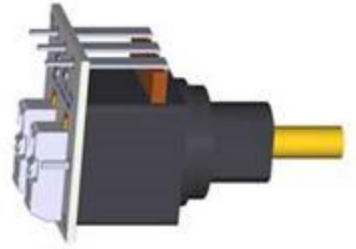
## Article number structure

---

### DimIn

Article code	Article	Description
105390	DimIn DALI PHM126	DALI type 2 with 1 channel and PHM126
105117	DimIn DALI DT8	DALI type 2 prepared for 2 channels for HCL
105111	DimIn Casambi	Casambi Wireless Bluetooth system
105040	DimIn POT	Potentiometer dimming internally in a luminary

### Accessories

Article code	ARTICLE NAME	DimIn Potentiometer design
105148	Dimin Potentiometer	

## Ordering data

---

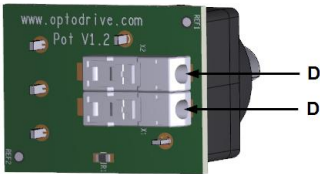
### DimIn – Packaging information

Description	Qty (pcs)	Dimension (cm)			GW (kg)
		Length	Width	Height	
Inner box	288	35.6	22.7	9.6	1.5
Outer box	2304	46.5	37.5	39.6	TBD

## Wire connection

To obtain additional functionality, the LED Module needs to have an additional module mounted in the IoT interface.

### Potentiometer card

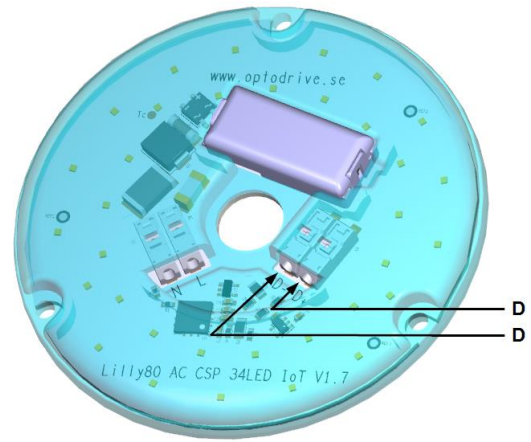


The Pot potentiometer board works with the DimIn Pot functionality module. D + or D- play a certain role as they change the dimming direction depending on the connection.

### Wire Connections (DALI or other)

Connect BUS control cables from the DALI control unit or Master unit (standard product that Optoga does not supply) or cables from DimIn Pot to D + and D- on the LED module. This depends on whether there is a DALI or DimIn Pot module mounted on the LED module.

DALI is polarity independent so it does not matter which of D + and D- is connected.

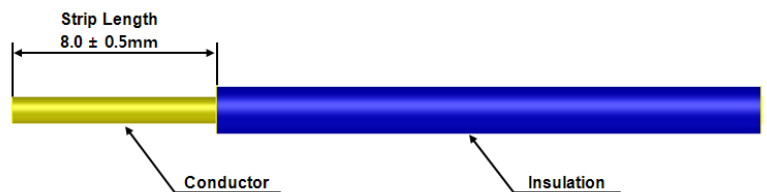


### Connector

Type	Push In type
------	--------------

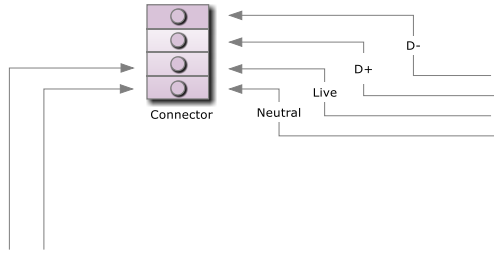
### Wire (Recommended)

Type of wire	AWG	mm <sup>2</sup>
Stranded	22-20	0.32-0.5mm <sup>2</sup>
Solid	24-18	0.51-1.02Ø (0.2-0.8mm <sup>2</sup> )
Insulation diameter	Max 2.1 mm	



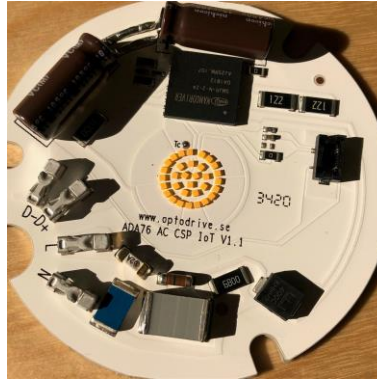
## Wiring for different DimIn versions

### Casambi



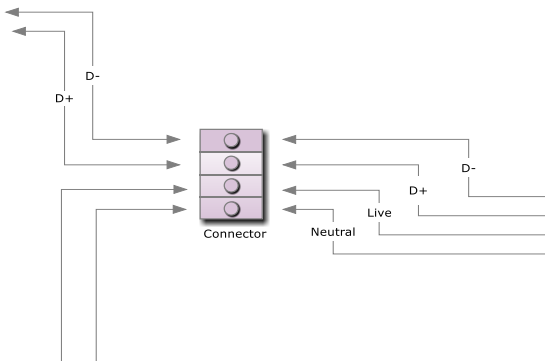
Incoming Wires 110/230VAC

LED Module with IoT (DimIn Casambi)



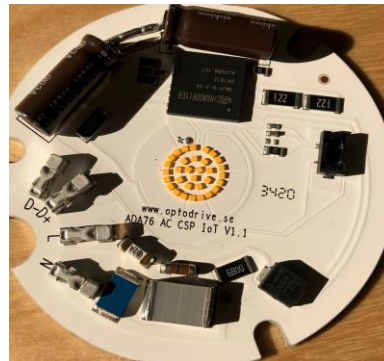
### DALI

DALI BUS Incoming



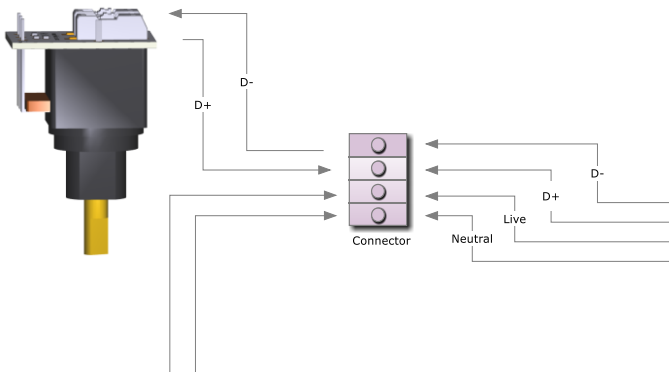
Incoming Wires 110/230VAC

LED Module with IoT (DimIn DALI)



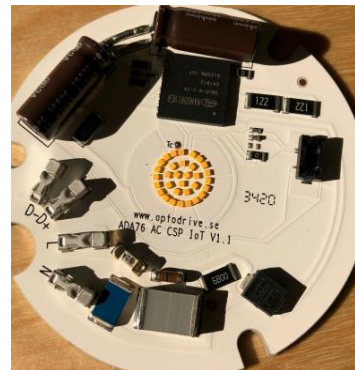
### POT / Potentiometer

Potentiometer



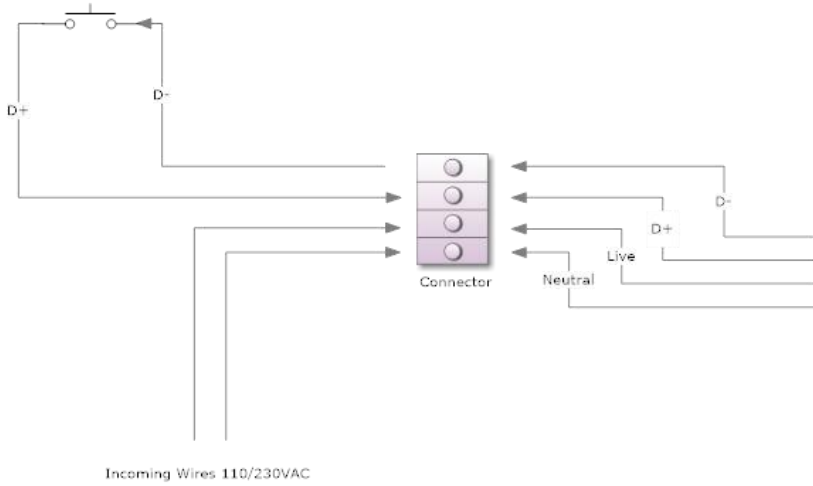
Incoming Wires 110/230VAC

LED Module with IoT (DimIn POT)

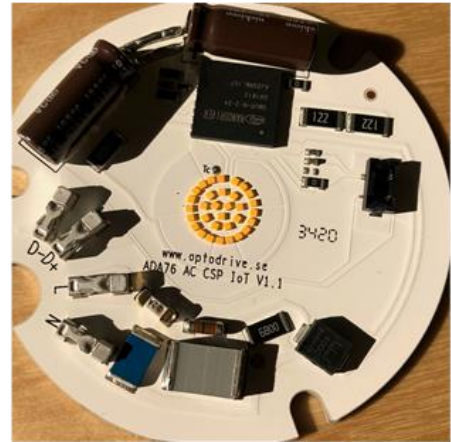


## Switch

Momentary Switch (Switch DIM)



LED Module with IoT (DimIn Switch)





## ECO System provided

---

### DALI

This is a bus-powered device and it works with the Eco-System DALI-2. DALI Digital addressable lighting interface, or DALI, is a global standard that enables ballasts, controllers, switches and sensors to communicate with other DALI-compliant devices. DALI (Digital Addressable Lighting Interface) is a standard for creating compatibility between HF lights for different manufacturers. A light control system where you can easily control single or group of luminaires seamlessly from 100 percent down to 1 percent in some of the systems.

PHYSICAL MIN (PHM). This is "hard-coded" in the software and can never be changed by the end user / luminaire manufacturer. It defines the technically lowest dimming level the luminaire can handle.

MIN LEVEL. This can be fully changed to any level you want, between PHYSICAL MIN and 100%.

### DALI DT8

This is a standard solution over DALI for Human Centric Lighting. A two channel solution following the standard of CCT change.

DT8 logic is controlled with only one DALI address, which then controls both the cold white and the warm white LEDs. Thus, the functionality with different color temperatures does not require programming with regard to mixing of cold and warm light as the logic is built into the control of the LED module. Desired color temperatures in different scenes are selected directly when programming.

### Casambi

Casambi Technologies wireless lighting control solution is not just a lighting control system – Casambi is a technology. Based on Bluetooth Low Energy, Casambi has developed an own proprietary mesh network where all the intelligence of the system is replicated in every node and in such a way creates a system with no points of failure. The solution is self-healing and self-organizing. It also allows for firmware updates over the network allowing any kind of changes to be made over-the-air and in that way to be truly wireless. In this kind of fully distributed and symmetric architecture any unit can go offline and catch up from others when they return back online. Internet connection is only needed for user interface configurations for smartphones and tablets via cloud service.

### POT

This is a system for freestanding devices where we use a potentiometer on the same output for the wiring of DALI. We have designed a potentiometer that can be mounted and easily used for dimming, on/off, up and down.



## DimIn Control Module

Document no:  
n/a

Revision:  
1.2

Page:  
Page 14 of 21

Object:  
**Datasheet DimIn**

Author:  
SL

Date:  
2022-08-30

### Switch

To use a momentary switch internally or externally of the luminary to get a flicker free dimming. Dimming from 1% up to 100% in a sequence and shut off after 8 hours.



## DimIn Control Module

Document no:  
n/a

Revision:  
1.2

Page:  
Page 15 of 21

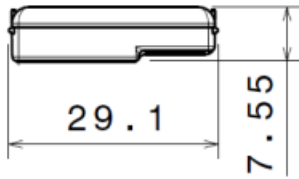
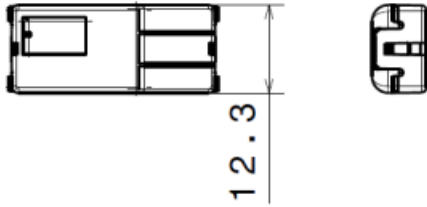
Object:  
Datasheet DimIn

Author:  
SL

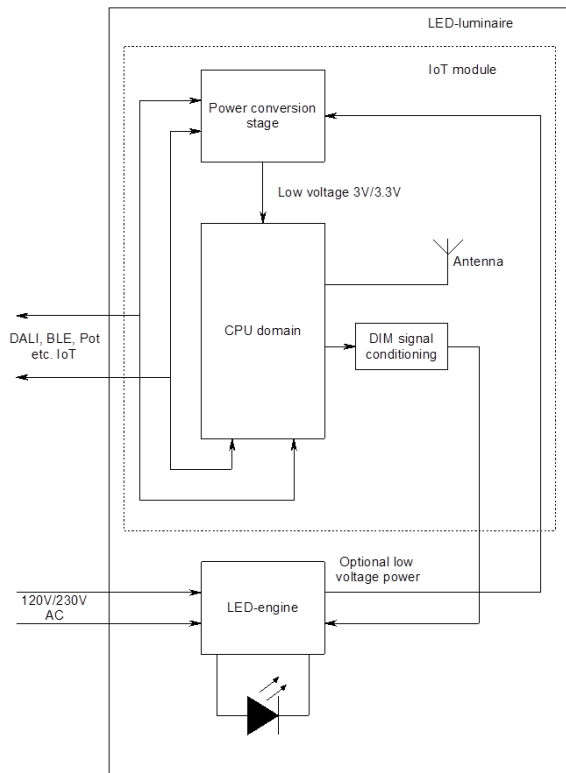
Date:  
2022-08-30

## Dimensions DimIn Module

---



## Technologies



The electronics in the box are then controlled by the external communication such as Sensor, wireless, wired Dali or other so that it can send back information into the 230VAC part to be able to control on / off, dimming or color change. This is based on the communication that has been introduced to the box from external media. The need we solve is that we have created a standardized interface that can both communicate, process data and change and control the light individually, in groups based on specialized (proprietary solutions) and / or standardized protocols. By doing so, both the manufacturer or the installer can adjust the type of communication to be used for the end consumer.

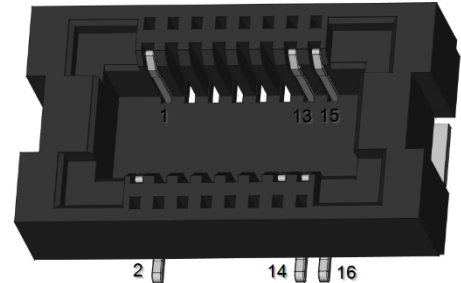


## DimIn Connectivity Connector Specification

The pin numbering of connectors can be seen below and to the right. This makes pin matching easy on the schematics.

PIN1-2 is used for incoming signals or outgoing depending on the solution.

PIN13-16 are used for DIM signals and allows for two separate dimming channels depending on design.



### PINOUT

Pin #	Pin naming	Pin Description
Pin1	D-	DALI has no polarity. Negative polarity of other functions.
Pin2	D+	DALI has no polarity. Positive polarity of other functions.
Pin13	V-EXT	External Voltage (Power output sensitive)
Pin14	DIM2+	Dim channel 2
Pin15	DIM-GND	Common GND for Dim channels
Pin16	DIM1+	Dim channel 1

### DIM interface (Pin14-16)

The LED-engines used is designed for a push-pull PWM-signal from DimIn module with minimum 8kHz PWM frequency.



## Verification of Conformity

---

The LED modules that DimIn are mounted into are tested at Intertek Semco according to IEC 62031.

Radio Disturbance	IEC 55015:2006 + A1:2007 + A2:2009	
SURGE	IEC 61000-4-5	1.5 kv
Fast transient BURST	IEC 61547	2 kv
SAFETY	IEC 62031:2008	
Photo Biological Safety	IEC 62471:2008	
ESD*	IEC 61000-4-2	8 kv Air discharge 4 kv Contact discharge

\* Please consult the document ESD standards on Optodrive ED, ID and AC

### Production Setup

Production in accordance with IPC-6012-B and IPC-A-600G class 2

The LED Module is in accordance to EU Directive 2002/95/EC (ROHS)

The bare PCB is isolation tested with 3000VDC/10mA for 10 seconds

### PCB Material Setup

In all questions regarding the bare PCB please use "Material Data sheet Optodrive" as a guideline.

## Light fitting routine tests

---

According to EN/IEC 60598-1 should the routine test be performed as a dielectric strength test or insulation test. Only the insulation test of 500Vdc should be performed according to standard, 1s with min 2MΩ.

No dielectric tests are allowed to be performed on OptoDrive LED Modules.



## Precautions for use

---

- This device should not be used in any type of fluids such as water, oil, organic solvent etc.
- When cleaning is required, use only water together with mild soap on the outside of the lens. Cleaning inside of the LED module is strictly prohibited.
- The appearance and specifications of the product may be modified for improvement without notice.
- Long-time exposure of sunlight or occasional UV exposure will cause lens discoloration.
- Opening of the LED module is prohibited due to risk of EMC, dust, grease and other exposures that will damage it.
- The LED Module should always be mounted to a proper heat sink before it's connected with its proper leads.

### Handling in regards to static electricity

- The Optodrive products have integrated circuits (IC) on board that may be damaged if exposed to static electricity. Please handle the products only while using equipment that prevents static electricity. Do not handle them without having ESD protection.
- The Optodrive products are not be installed into the end product without proper ESD protection.
- Optodrive LED Modules meet IEC61547:2009 and IEC61000-4-2. We recommend the light fixture manufacturer to take the mentioned standards under consideration.

### Storage before use

- Use only properly rated test equipment and tools for the rated voltage and current of the product being tested.
- It is strongly suggested to wear rubber insulated gloves and rubber bottom shoes while handling the product.
- Do not wear any conductive items (such as jewellery) which could accidentally contact electric circuits.
- Faults, lightning, or switching transients can cause voltage surges in excess of the normal ratings.
- Internal component failure can cause excessive voltages.
- Stored or residual electricity in long wire could be hazardous.



## ROHS III Compliant

---

All our LED modules meet the Restrictions of Hazardous Substances (RoHS III)!

There has been a growing consensus that Lead Free Systems should increase for the safety of our environment. It is a very serious problem that lead and other harmful materials are being used in commercial and industrial products, causing more and more environmental problems. This has led to regulations such as RoHS (Restriction of the use of certain Hazardous Substances) from the EU and the Japan Ministry of Trade and Industry (MITI). All LED module makers providing products to these countries should comply with these restrictions. In order to meet the RoHS III regulation, Optoga is strictly implementing a ban on lead and other hazardous materials in its products. This is in compliance with our responsibilities as good corporate citizens.

### Design for Environment:

According to the EU-directive (RoHS III) the following substances must not be used in this product

- Lead (Pb)
- Mercury (Hg)
- Cadmium (Cd)
- Chromium VI (Cr<sup>6+</sup>)
- Polybrominated biphenyls PBB
- Polybrominated diphenyl ethers PBDE
- Bis(2-ethylhexyl) phthalate DEPH
- Butyl benzyl phthalate BBP
- Dibutyl phthalate DBP
- Diisobutyl phthalate DIBP

# Do you want to know more about benefits of OptoDrive LED?

Read more about OptoDrive at [www.optoga.com](http://www.optoga.com).

You can contact us via [info@optoga.com](mailto:info@optoga.com).

You can also call us on +46 (0)589 490 950.

Optoga AB

Optoga was founded in November 2004 in Arboga, Sweden and has many years of experience in electronics design. The company develops and supplies LEDs and LED-module solutions for the lighting industry, vehicle manufacturers and electronics companies.

With the OptoDrive LED-module, Optoga has taken the initiative to replace strip lights, incandescent and halogen bulbs with LED-based sources.



Köpingsvägen 4 • SE-732 31 Arboga • SWEDEN

Tel +46 (0) 589 490 950

[info@optoga.com](mailto:info@optoga.com) • [www.optoga.com](http://www.optoga.com)

Copyright © 2017 Optoga AB. All rights reserved.