

01/2014

# Technical application guide

## PrevaLED® Cube DC G1

### LED modules

Light is **OSRAM**

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**Please note:**

All information in this guide has been prepared with great care. OSRAM, however, does not accept liability for possible errors, changes and/or omissions. Please check [www.osram.com/prevaled](http://www.osram.com/prevaled) or contact your sales partner for an updated copy of this guide.

# 1 Introduction

## 1.1 System overview

The brightness levels of today's LEDs are opening the door for the use of LEDs in general lighting applications that require high lumen output levels. Building an LED-based luminaire poses a new set of technical challenges, among them new optical requirements, providing adequate thermal management for stable operation and dealing with the ever-improving performance of LEDs. Nevertheless, LED technology also offers an unknown wealth of possibilities, providing access to unprecedented levels of performance and new ways of integration.

OSRAM's PrevaLED® family of LED modules addresses the challenges of LED-based lighting while providing users with great performance and flexibility at the same time. Enabled by the application of LED technology, PrevaLED® is aiming to push the envelope of what is possible in terms of performance and simplicity.

PrevaLED® Cube DC G1 LED modules are ideally suited for use in highly diffuse wall-mounted and ceiling-mounted luminaires in decorative, hospitality or domestic applications as well as in a broad range of wide-reflector-based applications such as downlights.

PrevaLED® Cube DC G1 LED modules provide specific benefits for these applications:

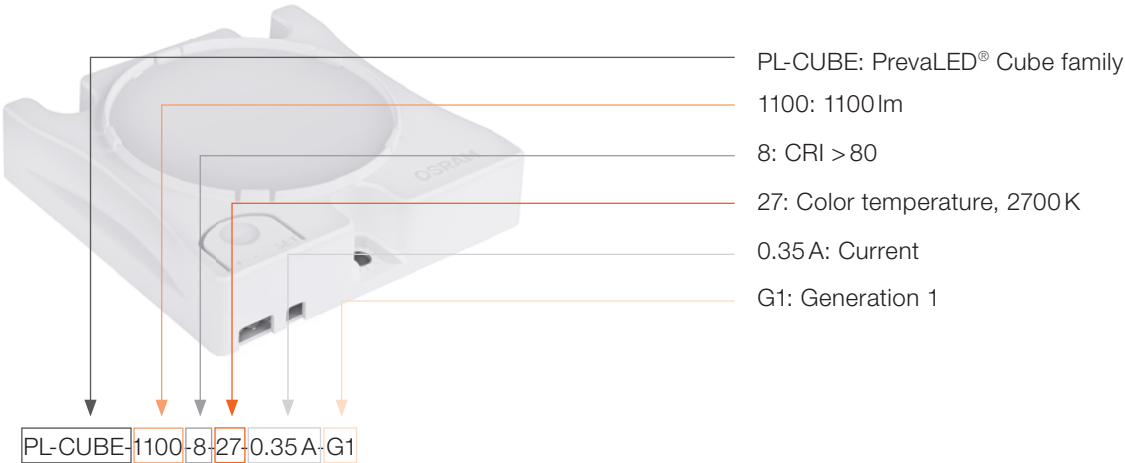
- Flexibility through three lumen packages and four color temperatures.
- Low height of optical contact area (OCA) of 18.6 mm for compact luminaire design in recessed ceilings with low depth.
- Near Lambertian light distribution for best quality of light in diffuser as well as reflector-based applications.
- Industry-standard mounting holes and light-emitting surface (LES) for use with standard heat sink and reflector accessories.
- System warranty in combination with OSRAM OPTOTRONIC® power supplies.
- Light management options and optimized operation with OSRAM OPTOTRONIC® power supplies.
- Overdrive of up to 4000 lm.

At present, PrevaLED® Cube DC G1 LED modules are available as 1100-lm, 2000-lm and 3000-lm packages in four colors (2700 K, 3000 K, 3500 K and 4000 K) with a color reproduction of  $R_a > 80$ .



1.2 Nomenclature and marking

PrevaLED® Cube DC G1 LED modules follow a consistent naming convention for identifying key parameters of the G1 LED module.



1.3 Ordering information

Market	Product number	Product reference	CCT [K]	Target flux [lm]
Global	4052899 <b>909588</b>	PL-CUBE-1100-830-0.35A-G1	3000	1100
	4052899 <b>909601</b>	PL-CUBE-1100-840-0.35A-G1	4000	1100
	4052899 <b>909625</b>	PL-CUBE-2000-830-0.5A-G1	3000	2000
	4052899 <b>909649</b>	PL-CUBE-2000-840-0.5A-G1	4000	2000
	4052899 <b>909663</b>	PL-CUBE-3000-830-0.7A-G1	3000	3000
	4052899 <b>909687</b>	PL-CUBE-3000-840-0.7A-G1	4000	3000
On demand	4052899 <b>909571</b>	PL-CUBE-1100-827-0.35A-G1	2700	1100
	4052899 <b>909595</b>	PL-CUBE-1100-835-0.35A-G1	3500	1100
	4052899 <b>909618</b>	PL-CUBE-2000-827-0.5A-G1	2700	2000
	4052899 <b>909632</b>	PL-CUBE-2000-835-0.5A-G1	3500	2000
	4052899 <b>909656</b>	PL-CUBE-3000-827-0.7A-G1	2700	3000
	4052899 <b>909670</b>	PL-CUBE-3000-835-0.7A-G1	3500	3000

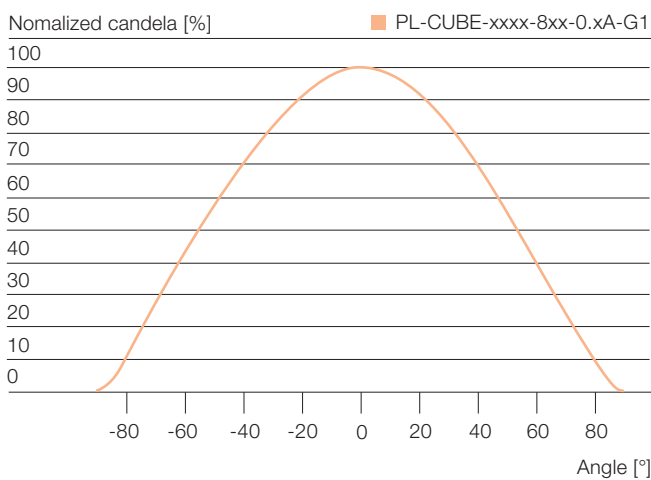
## 2 Optical considerations

PrevaLED® Cube DC G1 LED modules can be applied in diffuse wall-mounted and ceiling-mounted luminaires without the need for further optical accessories.

### 2.1 Light distribution

The light distribution of PrevaLED® Cube DC G1 LED modules is shown below. They create a beam angle of 110° FWHM. The typical candela distribution plot is shown below.

#### PL-CUBE-xxxx-8xx-0.xA-G1



### Maximum luminous intensity values

Product reference	Peak intensity [cd]
PL-CUBE-1100-827-0.35A-G1	401
PL-CUBE-1100-830-0.35A-G1	428
PL-CUBE-1100-835-0.35A-G1	450
PL-CUBE-1100-840-0.35A-G1	462
PL-CUBE-2000-827-0.5A-G1	658
PL-CUBE-2000-830-0.5A-G1	703
PL-CUBE-2000-835-0.5A-G1	739
PL-CUBE-2000-840-0.5A-G1	759
PL-CUBE-3000-827-0.7A-G1	985
PL-CUBE-3000-830-0.7A-G1	1052
PL-CUBE-3000-835-0.7A-G1	1105
PL-CUBE-3000-840-0.7A-G1	1136

The light-emitting surface of the LED modules is covered by a diffuser to ensure a homogeneous, smooth light distribution. Please ensure that the temperature of the diffuser does not exceed 120 °C.

### 2.2 Reflector design

PrevaLED® Cube DC G1 LED modules can also be used with secondary optics. As their optical interface has the same dimensions as common downlight modules on the market, they can be combined with available off-the-shelf secondary optics.

For optics support, you can find our partners via OSRAM's LED Light for You network: [www.ledlightforyou.com](http://www.ledlightforyou.com).

Moreover, standard components and support for reflector design are available e.g. through the following partners:

#### Possible secondary optics suppliers

Company	Country	Website
A.A.G. Stucchi	Italy	<a href="http://www.aagstucchi.it">www.aagstucchi.it</a>
ACL Reflektoren	Germany	<a href="http://www.reflektor.com">www.reflektor.com</a>
Almeco Group	Italy	<a href="http://www.almecogroup.com">www.almecogroup.com</a>
Bender + Wirth	Germany	<a href="http://www.bender-wirth.com">www.bender-wirth.com</a>
Carclo Optics	UK	<a href="http://www.carclo-optics.com">www.carclo-optics.com</a>
Fraen Corporation	USA	<a href="http://www.fraensrl.com">www.fraensrl.com</a>
Jordan	UK	<a href="http://www.jordanreflectors.co.uk">www.jordanreflectors.co.uk</a>
LEDiL	Finland	<a href="http://www.ledil.com">www.ledil.com</a>

OSRAM provides mechanical (3D files) and optical simulation data (ray files) to support customized reflector design. Mechanical files can be downloaded at [www.osram.com/prevaled](http://www.osram.com/prevaled). Ray file data are available at [www.osram.com](http://www.osram.com) via the "Tools & Services" portal.



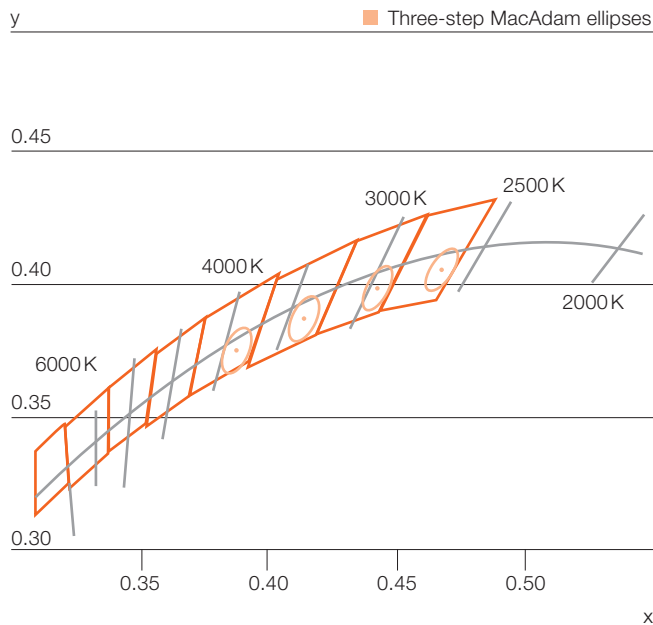
### 2.3 Color temperature and color rendering

Currently, PrevaLED® Cube DC G1 LED modules are available in two color temperatures: 3000K and 4000K. 2700K and 3500K are available on request. The color coordinates within the CIE 1931 color space are given below.

	2700K	3000K	3500K	4000K
<b>Cx</b>	0.461	0.437	0.410	0.385
<b>Cy</b>	0.405	0.398	0.387	0.375

Within each available color temperature, the PrevaLED® Cube DC G1 series provides a maximum color variation of three threshold value units (MacAdam steps). The following diagram shows these threshold values within the CIE 1931 color space.

### Color coordinates



PrevaLED® Cube DC G1 LED modules provide a color rendering index (CRI) of > 80. The table below shows the individual  $R_a$  values from R1 to R16 for the available color temperatures.

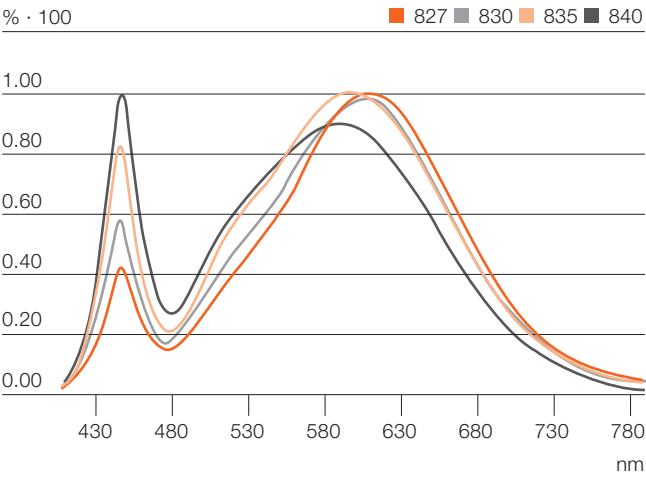
### Color rendering

	Dusky pink	Mustard yellow	Yellowish green	Light green	Turquoise	Azure	Aster violet	Lilac violet	Red, saturated	Yellow, saturated	Green, saturated	Blue, saturated	Pink, skin color	Leaf green	General CRI
	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	$R_a$
<b>CCT = 2700K</b>	80	91	97	79	80	91	84	62	18	77	76	70	82	98	82
<b>CCT = 3000K</b>	81	90	96	80	80	86	85	64	20	76	77	67	83	98	83
<b>CCT = 3500K</b>	82	90	94	80	81	84	86	67	22	74	77	63	83	97	83
<b>CCT = 4000K</b>	82	90	90	81	82	84	88	70	25	74	78	59	84	96	85

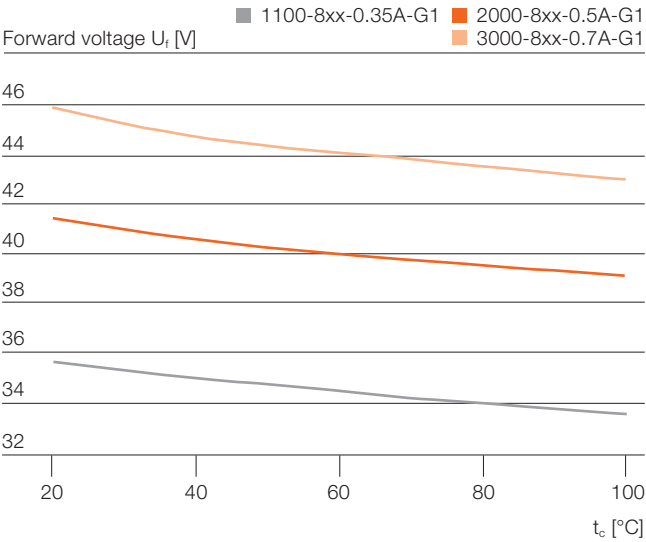
2.4 Spectral distribution

The typical spectral distribution of the PrevaLED® Cube DC G1 LED modules is shown in the following diagram.

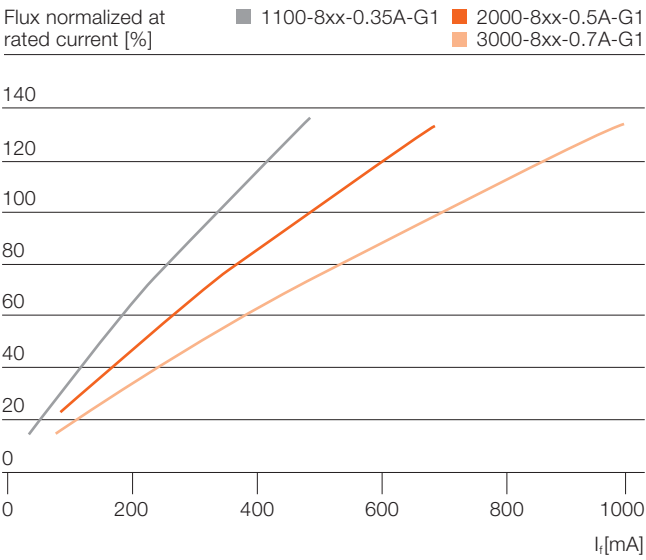
Spectral distribution



Typical forward voltage as a function of case temperature



Typical flux performance as a function of drive current\*



\* The plots are normalized to rated drive current.

## 3 Ingress protection

PrevaLED® Cube DC G1 LED modules are recommended for indoor use only and have an ingress protection rating of IP20. Please ensure that the housing of your luminaire provides the required ingress protection for your application.

For further information, please have a look at the technical application guide "IP codes in accordance with IEC 60529", which can be downloaded at [www.osram.com](http://www.osram.com).

## 4 Electrical considerations

### 4.1 Safety information

The design of the LED modules ensures that the requirements of IEC/EN 62031 and IEC/EN 60598-1 are met. The LED module can be mounted directly on an exposed housing without further insulation.

The luminaire manufacturer is responsible for providing the suitable and mandatory clearance and creepage distances for the luminaire. PrevaLED® Cube DC G1 LED modules are intended for use only with SELV-rated control gears.

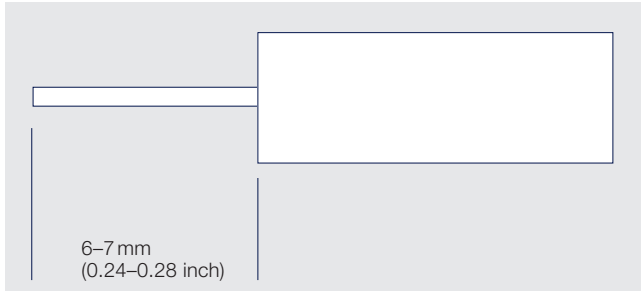




## 4.2 Wiring information

PrevaLED® Cube DC G1 LED modules have to be used with constant-current power supplies. The input clamps can handle solid or stranded wire with a cross-section of 0.2 to 0.75 mm<sup>2</sup> (AWG 18–24). The use of solid wire is recommended. Confirm the polarity using pins marked “+” and “-“ before connecting the power supply to the LED module.

### Wire preparation



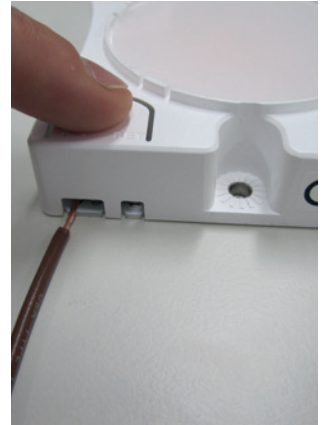
Please insert the wires in 0° orientation to the PCB.

### Notes:

- The connector is designed for three poke-in and release cycles.
- The installation of LED modules has to be carried out in compliance with all applicable electrical and safety standards. Only qualified personnel should be allowed to perform installations.



**Solid wire**  
Plug directly



**Flexible wire**  
1. Lightly press the push button of the connection clamp  
2. Insert the flexible wire

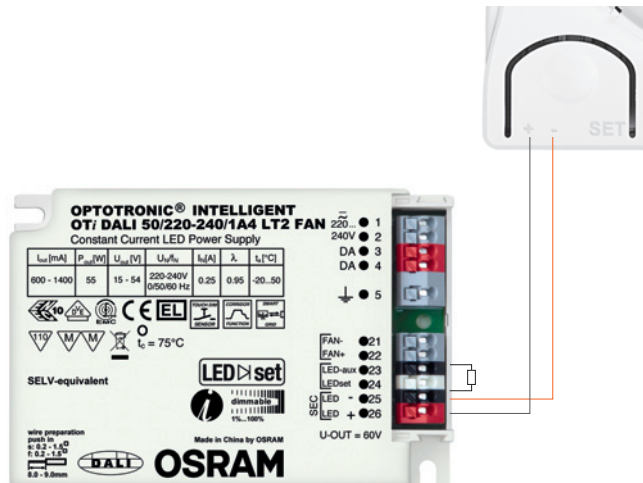
### 4.3 OTi electronic control gear series

If you use the PrevaLED® Cube DC G1 series in combination with the OSRAM OTi control gear series, you will get the best results.

To adjust the current to the nominal current for every module, use the following resistors and connect them between the LEDset and the LED aux connector:

#### LEDset resistors

Product reference	$I_f$ [A]	R [Ohm]
PL-CUBE-1100-830-0.35A-G1	0.331	15106
PL-CUBE-1100-840-0.35A-G1	0.304	16447
PL-CUBE-2000-830-0.5A-G1	0.531	9416
PL-CUBE-2000-840-0.5A-G1	0.486	10288
PL-CUBE-3000-830-0.7A-G1	0.745	6711
PL-CUBE-3000-840-0.7A-G1	0.682	7331



### 4.4 OT FIT electronic control gear series

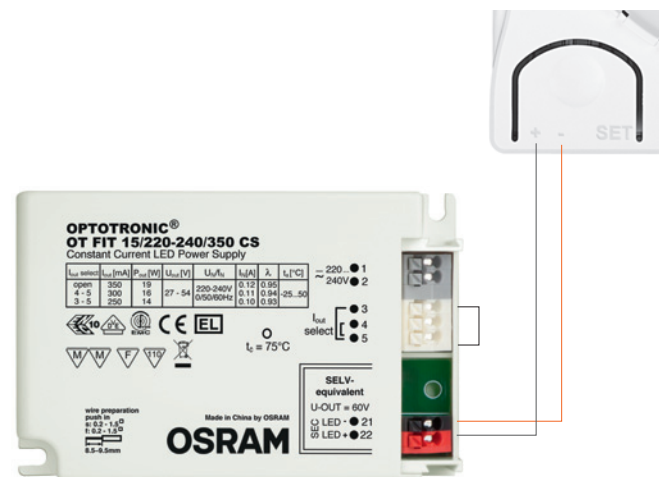
It is also possible to use the PrevaLED® Cube DC G1 series with a constant-current driver. The OT FIT series offers different available currents. To wire the module to the ECG, please connect the ports LED+ and LED- to the module as shown in the image below. The current is selected by a bridge between ports 3, 4 and 5:

In this case, an OT FIT 15 is used.

No bridge: 250 mA

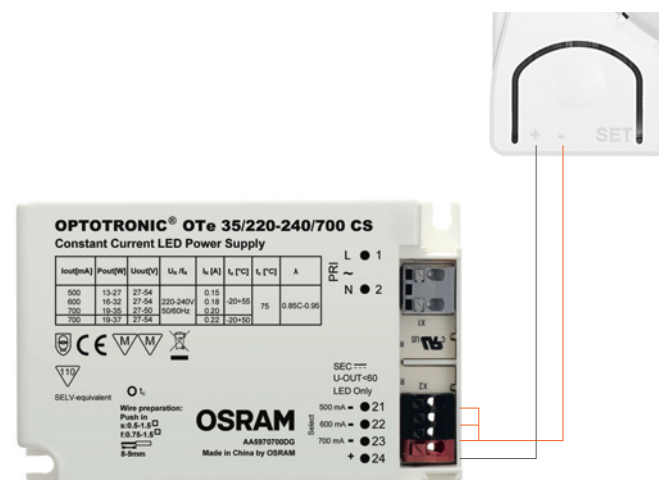
Bridge between 4 and 5: 300 mA

Bridge between 3 and 5: 350 mA



### 4.5 OTe electronic control gear series

If you would like to use the OSRAM OTe series, please connect the terminal LED+ to the module and select the desired current by connecting it to only one of the output terminals 21, 22 or 23.



**Note:** Select only one connection terminal!!

#### 4.6 Maximum allowed number of control gears per circuit breaker

	B16	B10
OTe 35/700	50	30
OT 35/LCTS	84	52
OT 45 LCTS	60	40
OT 45 DALI LCTS	47	18
OTe 25/CS	50	30
OTe 35/CS S	44	28
OTe 35/CS	25	15
OTe 50/1A4 CS	25	15
OTe 50/1A0 CS	25	15
OTe 50/CS FAN	25	15
OT FIT 15CS	28	17
OT FIT 25/CS	28	17
OT FIT 35/CS	28	17
OTi DALI 25	84*	52*
OTi DALI 35	60*	40*
OTi DALI 50 FAN	13	18

\* Preliminary data

#### PrevaLED® Cube DC G1 with OPTOTRONIC® compatibility

ECGs	Typ. current [mA]	Voltage [V]	OT 15/350 PC	OT 35/700 LCTS	OT 45/700 LCTS	OT 45/700 LCTS DALI	OTe 35/700	OTe 25 CS	OTe 35 CS	OT FIT 15	OT FIT 25	OT FIT 35	OTi DALI 25	OTi DALI 35
Modules														
Dimming														
1110lm-830	350	34	■					■		■			■	
1110lm-840	350	34	■					■		■			■	
2000lm-830	500	40		■	■	■		■	■		■	■	■	■
2000lm-840	500	40		■	■	■		■	■		■	■	■	■
3000lm-830	700	44			■	■	■		■			■		■
3000lm-840	700	44		■	■	■	■		■			■		■

■ System fit OK for one or more current settings

■ System fit OK. Typical flux level (lm) if deviating from nominal

■ To be confirmed

#### 4.7 Electrostatic discharge (ESD)

The PrevaLED® Cube DC G1 has a ESD rating of >8kV (Class 3B, IEC 60749-26). Even though the ESD sensitivity is very low, it is recommended to follow ESD precautions if possible to avoid any possibility of damage, especially when humidity is very low.

## 5 Thermal considerations

The proper thermal design of an LED luminaire is critical for achieving the best performance and ensuring the longest lifetime of all components. Due to the high efficacy of PrevaLED® Cube DC G1 LED modules, only a partial amount of the introduced electrical power has to be dissipated through the back of the LED module. The thermal power that has to be dissipated for PrevaLED® Cube DC G1 LED modules is given below.

### Thermal power data

Product reference	I <sub>r</sub> [mA]	Typical thermal power [W]*	Max. thermal power [W]*	Max. allowable thermal resistance R <sub>th</sub> [K/W]**
PL-CUBE-1100-827-0.35A-G1	356	8.5	9.4	4.8
PL-CUBE-1100-830-0.35A-G1	331	7.6	8.4	5.4
PL-CUBE-1100-835-0.35A-G1	313	6.9	7.6	5.9
PL-CUBE-1100-840-0.35A-G1	304	6.6	7.3	6.2
PL-CUBE-2000-827-0.5A-G1	573	17.7	19.5	2.3
PL-CUBE-2000-830-0.5A-G1	531	14.7	16.2	2.8
PL-CUBE-2000-835-0.5A-G1	501	14.7	16.2	2.8
PL-CUBE-2000-840-0.5A-G1	486	12.8	14.1	3.2
PL-CUBE-3000-827-0.7A-G1	804	27.3	30.0	1.5
PL-CUBE-3000-830-0.7A-G1	745	22.8	25.1	1.8
PL-CUBE-3000-835-0.7A-G1	704	22.8	25.1	1.8
PL-CUBE-3000-840-0.7A-G1	682	19.8	21.8	2.1

\* Value measured at the tc point at a reference temperature (tr) of 70 °C.

\*\* Value measured on the back of the luminaire at an ambient temperature of 25 °C.

### Note:

To ensure a safe and reliable operation, the module must be attached to a suitable cooling solution (e.g. a heat sink).

Depending on the application and the chosen LED module, passive cooling can be sufficient. In critical applications (e.g. small available heat sink size or highly reduced air-flow), active cooling may be required. Active cooling combines a heat sink with a fan or a similar device to maximize the thermal dissipation of the passive heat sink.

### 5.1 Thermal interface material and other accessories

When mounting a PrevaLED® Cube DC G1 LED module within a luminaire, it is recommended to use thermal interface material (TIM) between the back of the LED module and the luminaire housing or heat sink. It is recommended to use thermal paste, but thermal foil can also be used. In order to balance possible unevenness, the material should be applied as thinly as possible, but as thickly as necessary. In this way, air inclusions, which may otherwise occur, are replaced by TIM and the required heat conduction between the back of the LED module and the contact surfaces of the luminaire housing will be achieved. For this purpose, the planarity and smoothness of the surface should be optimized. The list below is a selection of suppliers of thermal interface materials. Additional partners for thermal management support can also be found via OSRAM's LED Light for You network: [www.ledlightforyou.com](http://www.ledlightforyou.com).

Company	Country	Website
Arctic Silver	USA	<a href="http://www.arcticsilver.com">www.arcticsilver.com</a>
Bergquist	USA	<a href="http://www.bergquistcompany.com">www.bergquistcompany.com</a>
Fujipolymer	USA	<a href="http://www.fujipoly.com">www.fujipoly.com</a>
Graf-Tech	USA	<a href="http://www.graftech.com">www.graftech.com</a>
Kerafol	Germany	<a href="http://www.kerafol.com">www.kerafol.com</a>
Laird Technologies	USA	<a href="http://www.lairdtech.com">www.lairdtech.com</a>

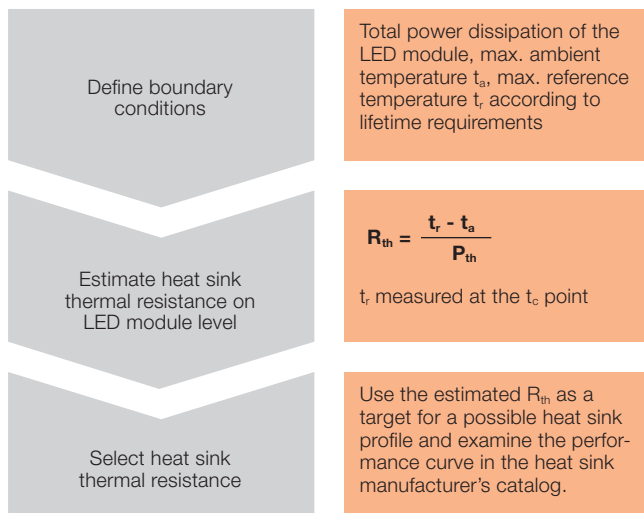
It is recommended that the whole area of the PCB of a PrevaLED® Cube DC G1 LED module is in contact with the solid material of the heat sink. The minimum area of the PCB that has to have contact with the solid material of the heat sink is 65 x 65 mm.

A thermal system always depends on many factors, such as airflow, ambient temperature etc. Please check your entire cooling system by performing a thermal measurement in steady-state condition. The list below is a selection of suppliers of different cooling solutions.

Company	Country	Website
AVC	Germany	<a href="http://www.avc-europa.de">www.avc-europa.de</a>
Fischer Elektronik	Germany	<a href="http://www.fischerelektronik.de">www.fischerelektronik.de</a>
Mechatronix	Taiwan	<a href="http://www.mechatronix-asia.com">www.mechatronix-asia.com</a>
Nuventix	USA	<a href="http://www.nuventix.com">www.nuventix.com</a>
Aavid Thermalloy	USA	<a href="http://www.aavid.com">www.aavid.com</a>
Cool Innovations	USA	<a href="http://www.coolinnovations.com">www.coolinnovations.com</a>
Meccal	Italy	<a href="http://www.meccal.com">www.meccal.com</a>
Sunon	Taiwan	<a href="http://www.sunon.com">www.sunon.com</a>
Wakefield-Vette	USA	<a href="http://www.wakefield-vette.com">www.wakefield-vette.com</a>

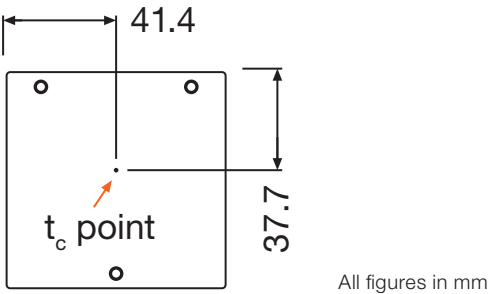
### 5.2 Cooling systems and heat sinks

For the selection of a suitable heat sink, several points regarding thermal resistance have to be considered. The selection is usually done through the following necessary steps:



5.3 T<sub>c</sub> point location and temperature measurement

The t<sub>c</sub> point is the location to check if the chosen cooling solution (heat sink and TIM) is sufficient to ensure the LED module's performance. The t<sub>c</sub> point is located on the back of the LED module under the center of the diffuser (see image below).






Location of the t<sub>c</sub> point

Thermocouple

Use a thermocouple that can be glued onto the t<sub>c</sub> point. Make sure that the thermocouple is fixed with direct contact to the t<sub>c</sub> point. You can, for example, use an acrylic adhesive (e.g. type Loctite 3751).



Different thermocouples

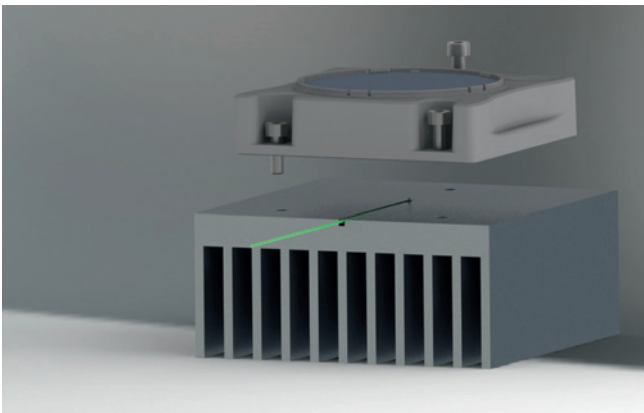
Illustration	Description	Temperature range [°C]
	PVC-insulated thermocouple	-10 ... +105
	PFA-insulated thermocouple	-75 ... +260
	Sprung thermocouple	-75 ... +260

To measure the temperature and to guarantee a good thermal coupling between the LED module and the heat sink, drill a hole into the heat sink and push the thermocouple through the heat sink. To ensure a direct contact between the thermocouple and the PCB, it is recommended to glue the thermocouple onto the PCB.



It is also possible to use a sprung thermocouple. A suitable type is: Electronic Sensor FS TE-4-KK06/09/2m. Please note that a good thermal contact between the thermocouple and the PCB is required. Please refer to the data-sheet and the application guideline of the manufacturer to ensure correct handling.

Another possible way is to create a small groove along the top surface of the heat sink.



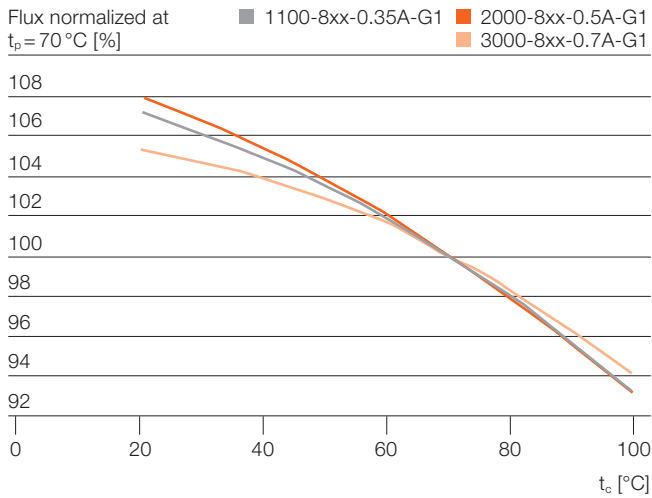


# 6 Lifetime and thermal behavior

## 6.1 Flux as a function of drive current and case temperature

The typical flux performance of PrevaLED® Cube DC G1 LED modules as a function of drive current and case temperature is shown below. The plots are normalized to the nominal drive current and a case temperature of 70 °C.

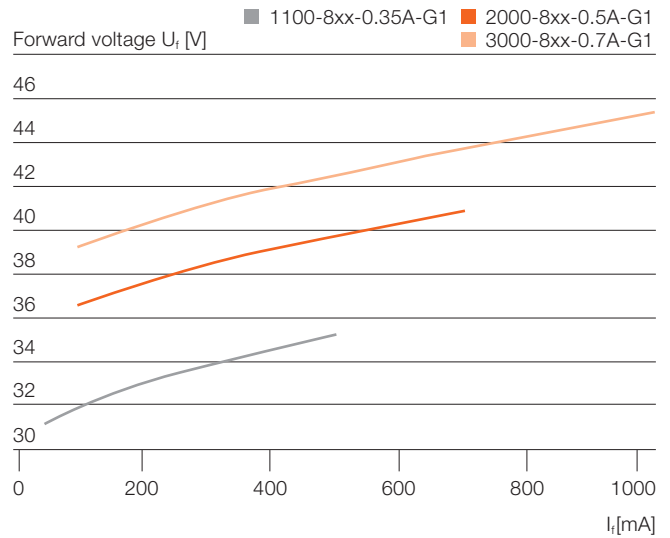
### Flux as a function of $t_c$ temperature



## 6.2 Voltage as a function of drive current

The typical forward voltage of PrevaLED® Cube DC G1 LED modules as a function of drive current and case temperature is shown below. The plots are normalized to rated drive current and a case temperature of 70 °C.

### Forward voltage as a function of drive current



### 6.3 Lifetime as a function of temperature

PrevaLED® Cube DC G1 LED module performance is measured at a typical operating  $t_c$  of 70 °C. The maximum temperature at the  $t_c$  point must not exceed 80 °C\* to have an expected lifetime ( $L_{70B_{50}}$ ) of 50 000 hours.

For the definition of the lifetime of an LED module, please refer to IEC/PAS 62717, where the following types are defined (examples):

- $L_0C_{10}$  is the lifetime where the light output is 0 % for 10 % of the LED modules.
- $L_{70}F_{50}$  is the lifetime where the light output is  $\geq 70$  % for 50 % of the LED modules. F value includes reduction of lumen output over time including abrupt degradation (flux = 0).
- $L_{70}B_{50}$  is the lifetime where the light output is  $\geq 70$  % for 50 % of the LED modules. B value includes only gradual reduction of lumen output over time (not the abrupt degradation of flux).
- If the performance temperature  $t_p$  of 70 °C is maintained, the PrevaLED® Cube DC G1 LED modules have an average lifetime of 50 000 h ( $L_{80}B_{50}$  and  $L_0C_{10}$ ). The maximum temperature measured at the  $t_c$  point must not exceed 100 °C.

**Note:** Higher temperatures lead to a shorter lifetime of the PrevaLED® Cube DC G1 LED modules. Moreover, the failure rate will also increase.

The following tables show the lifetime of PrevaLED® Cube DC G1 LED modules according to IEC/PAS 62717.

#### PL-CUBE-1100 G1, PL-CUBE-2000 G1

	L70B10	L70B50	L80B10	L80B50	L0C10	L0C50	L70F10	L70F50	L80F10	L80F50
<b>Lifetime [h] at <math>t_p = 65</math> °C</b>	50000	50000	33000	50000	50000*	50000*	50000	50000	33000	50000
<b>Lifetime [h] at <math>t_p = 70</math> °C</b>	50000	50000	23000	50000	50000*	50000*	49000	50000	23000	50000
<b>Lifetime [h] at <math>t_p = 80</math> °C</b>	27000	50000	11000	35000	50000*	50000*	27000	50000	11000	35000
<b>Lifetime [h] at <math>t_p = 90</math> °C</b>	15000	37000	6000	18000	50000*	50000*	15000	37000	6000	18000

\* Expected to be higher

#### PL-CUBE-3000 G1

	L70B10	L70B50	L80B10	L80B50	L0C10	L0C50	L70F10	L70F50	L80F10	L80F50
<b>Lifetime [h] at <math>t_p = 65</math> °C</b>	50000	50000	47000	50000	50000*	50000*	50000	50000	44000	50000
<b>Lifetime [h] at <math>t_p = 70</math> °C</b>	50000	50000	32000	50000	50000*	50000*	50000	50000	30000	50000
<b>Lifetime [h] at <math>t_p = 80</math> °C</b>	35000	50000	15000	44000	50000*	50000*	31000	50000	15000	42000
<b>Lifetime [h] at <math>t_p = 90</math> °C</b>	20000	45000	8000	23000	38000	50000*	17000	42000	8000	22000

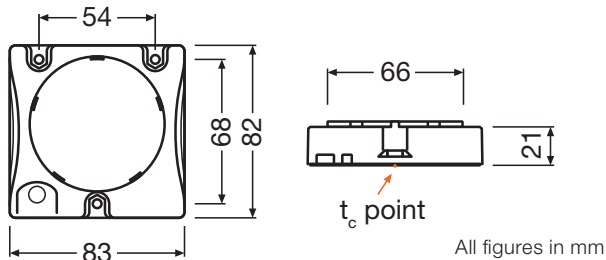
\* Expected to be higher

\*This value is subject to improvement. Please check the latest data-sheet at [www.osram.com](http://www.osram.com).

# 7 Mechanical considerations

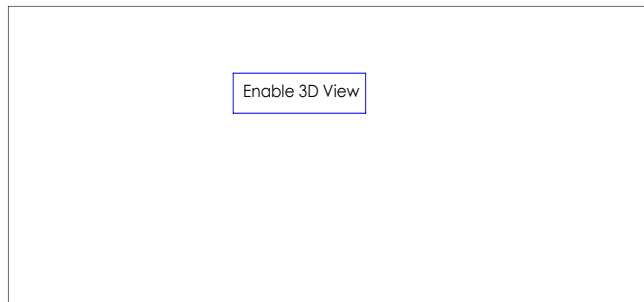
## 7.1 Outline drawing

The following schematic drawing provides further details on the dimensions of PrevaLED® Cube DC G1 LED modules.



## 7.2 3D drawing

For 3D files of PrevaLED® Cube DC G1 LED modules, please go to: <http://www.osram.com/prevalled>.

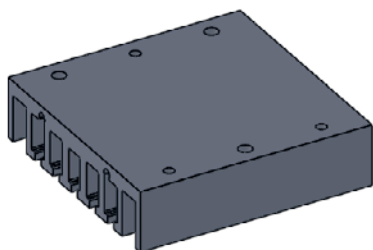


Move me!  
Movable 3D PrevaLED® Cube DC G1 LED module  
(works with Adobe Acrobat 7 or higher)

## PrevaLED® Cube ADP (EAN 4052899055590)

As an accessory to the PrevaLED® Cube DC G1 LED modules, a heat sink adapter is available to match the geometric dimensions for available off-the-shelf accessories.

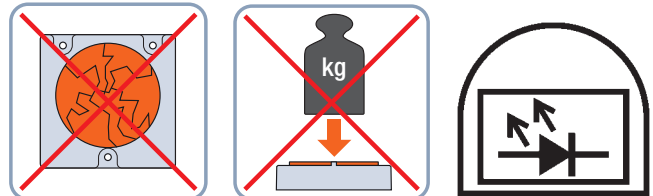
**Note:** The PrevaLED® Cube ADP is not a sufficient heat sink for all PrevaLED® Cube LED modules. For further information on thermal design, please refer to chapter 5: Thermal considerations.



## 7.3 Mechanical protection of the LED module

The housing of a PrevaLED® Cube DC G1 LED module should not be exposed to strong mechanical stress. Please apply force only to the dedicated mounting positions. Strong mechanical stress can lead to irreversible damage of the LED module.

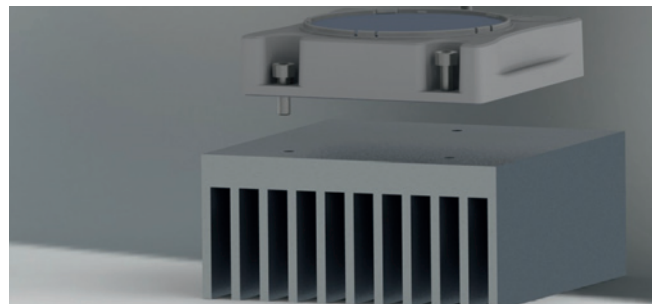
For operation in damp, wet or dusty environments, the user has to make sure that an adequate ingress protection is chosen. The LED module has to be protected by a suitable IP classification of the luminaire housing. Please consider the luminaire standard IEC 60598-1 as well as the different requirements for indoor and outdoor application.



**Note for France:** Due to specific national regulations, as defined in the standard EN 60598, it is not permitted to expose the light engine outside a luminaire housing.\*

## 7.4 Mounting

To fix a PrevaLED® Cube DC G1 LED module to a heat sink, use M4 cylinder head screws according to DIN 912 or ISO 4762. The required torque is 1 Nm ( $\pm 0.5$  Nm).



Mount the LED module from the top.

**Note:** Make sure that the cover of the LED module cannot be removed. Therefore, provide sufficient fixation of the cover, e.g. by screwing it to the heat sink.

## 7.5 Protection from corrosion

To avoid corrosion of electronic parts (such as LEDs) it is necessary to avoid corrosive atmosphere around the components. In case of LEDs, e.g.  $H_2S$  is a highly corrosive substance which could lead to a drastically shortened product lifetime. The source for  $H_2S$  are sulfur-cross-linked polymers – such as rubber. To ensure the absence of  $H_2S$ , we recommend using peroxide cross-linked materials, which are available on the market as an alternative to sulfur-cross-linked versions.

The general topic corrosion by moisture has to be ensured within the appropriate luminaire housing (see chapter 3: Ingress protection).

\* This fact is subject to change – please check the latest version of EN 60598.

## 8 Norms and standards

Safety:	IEC/EN 62031 IEC/EN 60598-1
Photobiological safety:	IEC/EN 62471 Risk group 1
Electromagnetic compatibility:	CISPR 15 IEC/EN 61547 IEC/EN 61000-3-2 IEC/EN 61000-3-3 EN 55015
Ingress protection:	IP20
Approvals:	UL 8750 recognized

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