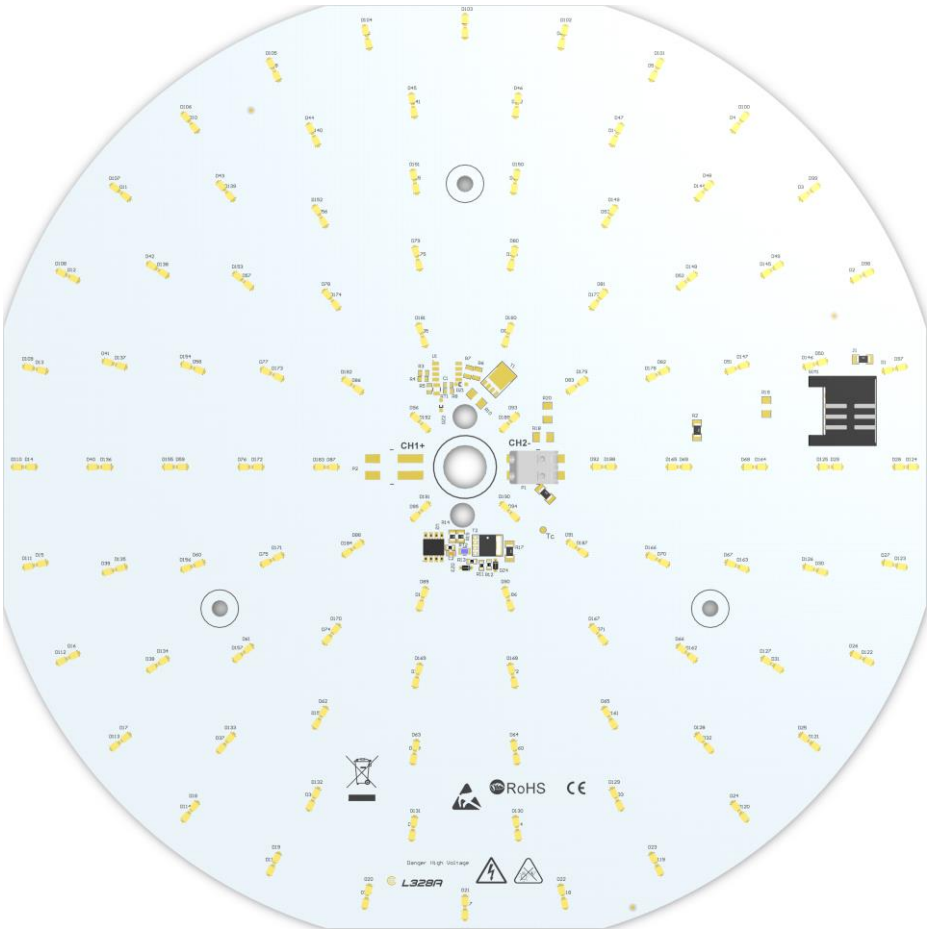
# R0-000230-xxx-Vxxxx-L328-Tx

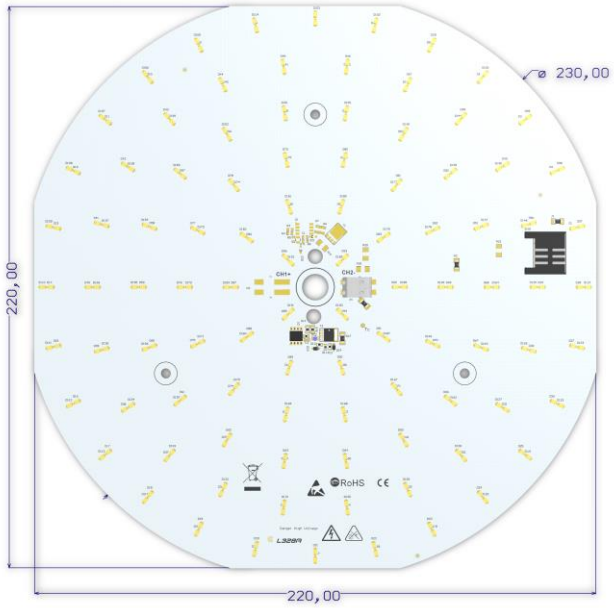


# R0-000230-xxx-Vxxxx-L328-Tx

## INTRODUCTION

LED module is an advanced light source designed for the best energy efficient and eco-friendly indoor lighting. It is based on medium power LEDs produced by the leader of the LED technology OSRAM. Using newest technology we provide the best solution for lighting. With a very high value of CRI and simple installation. Connecting few LED modules allows to create complex lighting. Optional push terminals provide quick installation of the entire lighting system. This solution is the best for indoor ceiling-mounted and wall-mounted luminaries.

| | |
|---|---|
| **LED Type** | OSRAM E2 - GW JBLMS1.EM |
| **LED Quantity** | 192 pcs |
| **Dimension** | dia 230 mm |
| **Power Supply Type** | Constant Voltage (CV) |
| **Power Supply Voltage** | 24 V DC |
| **Viewing Angle** | 120° |
| **Material Thickness** | 1,5 mm |
| **Cable Connection** | ADELS 351102 |
| **Max Ambient Temperature** | 45°C |
| **CRI** | >80 |




## FEATURES

LEDs have significant advantages compared to other types of lighting and are easy to use. LEDs are versatile and virtually maintenance free.

- Efficiency of the module up to 168 lm/W
- Smart available
- Rigid board LED module
- Viewing angle at 50% $I_V$: 120°
- High colour rendering index CRI >80
- Small colour tolerance
- Small luminous flux tolerances
- Colour temperatures 2700K, 3000K, 4000K, 5000K
- Optional push terminals for quick and simple wiring
- Dimmable
- Simple installation
- Long lifetime

## APPLICATIONS

- Ideal for ceiling-mounted and wall-mounted luminaries
- Retrofits and fixtures
- Accent and Effect Lighting
- Professional downlights
- Shop lighting

**CALCULATED PARAMETERS AT $T_J$ = 25°C AND $T_J$ = 65°C**

| | Power [W] | CCT [K] | Typ. CRI | Luminous Flux* [lm] | Module Efficacy* [lm/W] | Luminous Flux** [lm] | Module Efficacy** [lm/W] | Article Number |
|---|---|---|---|---|---|---|---|---|
| CV TITANIUM / TITANIUM SMART*** | 11,6 | 2700 | 83 | 1651 | 143 | 1543 | 134 | R0-000230-827-V0020-L328-Tx |
| | | | 93 | 1503 | 130 | 1404 | 122 | R0-000230-927-V0020-L328-Tx |
| | | 3000 | 83 | 1784 | 155 | 1667 | 145 | R0-000230-830-V0020-L328-Tx |
| | | | 93 | 1623 | 141 | 1517 | 132 | R0-000230-930-V0020-L328-Tx |
| | | 4000 | 83 | 1932 | 168 | 1806 | 157 | R0-000230-840-V0020-L328-Tx |
| | | | 93 | 1758 | 153 | 1643 | 143 | R0-000230-940-V0020-L328-Tx |
| | | 5000 | 83 | 1932 | 168 | 1806 | 157 | R0-000230-850-V0020-L328-Tx |
| | 17,2 | 2700 | 83 | 2384 | 138 | 2228 | 129 | R0-000230-827-V0030-L328-Tx |
| | | | 93 | 2169 | 126 | 2027 | 117 | R0-000230-927-V0030-L328-Tx |
| | | 3000 | 83 | 2575 | 149 | 2406 | 139 | R0-000230-830-V0030-L328-Tx |
| | | | 93 | 2343 | 136 | 2190 | 127 | R0-000230-930-V0030-L328-Tx |
| | | 4000 | 83 | 2790 | 161 | 2607 | 151 | R0-000230-840-V0030-L328-Tx |
| | | | 93 | 2539 | 147 | 2372 | 137 | R0-000230-940-V0030-L328-Tx |
| | | 5000 | 83 | 2790 | 161 | 2607 | 151 | R0-000230-850-V0030-L328-Tx |
| | 28,8 | 2700 | 83 | 3768 | 131 | 3521 | 122 | R0-000230-827-V0050-L328-Tx |
| | | | 93 | 3429 | 119 | 3204 | 111 | R0-000230-927-V0050-L328-Tx |
| | | 3000 | 83 | 4070 | 141 | 3804 | 132 | R0-000230-830-V0050-L328-Tx |
| | | | 93 | 3703 | 129 | 3461 | 120 | R0-000230-930-V0050-L328-Tx |
| | | 4000 | 83 | 4410 | 153 | 4121 | 143 | R0-000230-840-V0050-L328-Tx |
| | | | 93 | 4013 | 139 | 3750 | 130 | R0-000230-940-V0050-L328-Tx |
| | | 5000 | 83 | 4410 | 153 | 4121 | 143 | R0-000230-850-V0050-L328-Tx |

* - Parameters were calculated for temperatures $T_J$= 25°C

** - Parameters were calculated for temperatures $T_J$= 65°C

*** - Smart version has additional SIM slot with same parameters as normal version. Article number: T0 – Normal, TS - Smart

Value of these parameters were calculated for default bin and with tolerances of 15%.

Please contact us before ordering for more information.

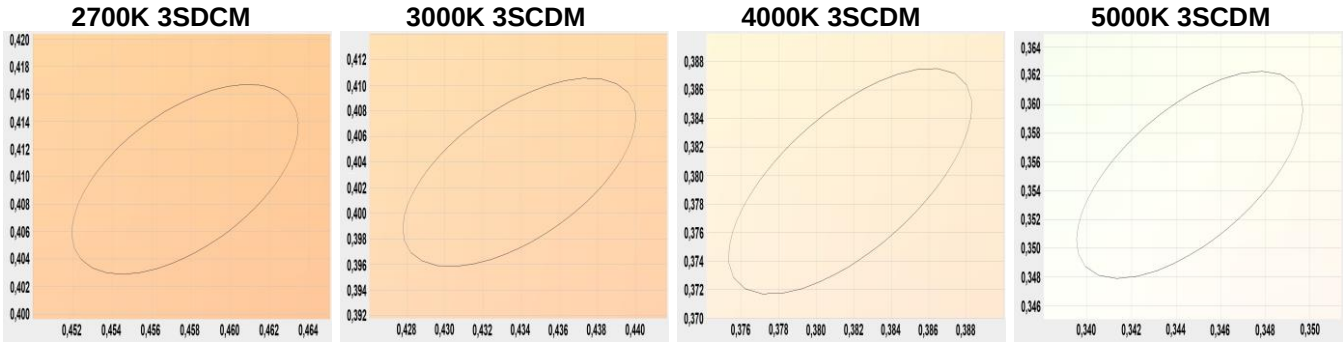
Parameters shown in table above are default and for temperatures $T_J$=25°C and $T_J$=65°C. Some of these parameters are temperature dependent and can be different during long time of operation. So it is impossible to order modules with the same parameters after some time. LED technology is developed fast and producers are creating new LEDs with better features very quick. If you need LED modules with different value of some parameters, we provide other LEDs with different colour temperature and features. It is possible to make modification of LED modules or create a new one. In such cases and for more information, please contact us before ordering. Please have all of this in mind when ordering LED modules.

### SMART

Smart LED modules are equipment with additional slot for controller. These drivers allow to control modules directly on board. Controllers specially design for this solution are very small and can use almost all wireless standards like Bluetooth, ZigBee or radio, also they may be controlled by motion, proxy sensor etc. Drivers are design to be compatible with as many as possible types of modules. Without driver in SIM slot LED modules are working like normal modules.

### MacAdam Ellipse

Producing LEDs with the same colour temperature is almost impossible. LEDs with similar colours are divided into bins. MacAdam Ellipses are used to describe differences in colour of LEDs with the same bin. When most people can't see very small differences in colours, these colours are in first step level of MacAdam Ellipse (1SDCM). If the differences are getting bigger, then number of step is increasing. Second zone of MacAdam ellipse (2SDCM) is twice bigger than first one and so on. Differences in colour for 3000K LEDs can be up to ±30K in 1SDCM. If bin is in 4SDCM, then colour differences should be less than ±100K. LEDs with smaller number of SDCM are better. Most common LEDs are in 4th to 7th step level, in other words human eyes certainly can see colour differences in LEDs that are ostensibly the same colour. In most of our projects have been used LEDs in 3rd step level, so differences in colour aren't as big as fourth step level of MacAdam Ellipse.




### Protection measures against damage

LED modules are delicate, even small mechanical stress may damage modules. Especially sensitive are LEDs. Such stresses should be avoided. If it is impossible, it should be reduced to minimum. Mechanical stresses such as pressure, bending, breaking, drilling, etc. may cause irreversible damage. Damaged LED modules aren't suitable for use.

Serious threat to LEDs is ESD. People generate very high electrostatic voltage. Such voltage decreases lifetime of LEDs and in worst case may destroy electronic components. Best way to avoid damage is use of electrostatic protection. Do not touch electronic components.

Additionally LED modules can be damaged by some chemical substances. Depends of elements the damage may be different. It is important not to use chemical substances like acids, organic acids, sulphur, alkalis, organic solvents, mineral oils, vegetable oils and synthetic oils, etc. We are not responsible for any loss, or damage resulting from improper use of modules! Guarantee become void in such cases.

Do not operate LED modules, when they aren't working properly. If modules are working incorrectly, turn off power supply. Damaged LED modules may cause electric shock or short circuit.

### Safety

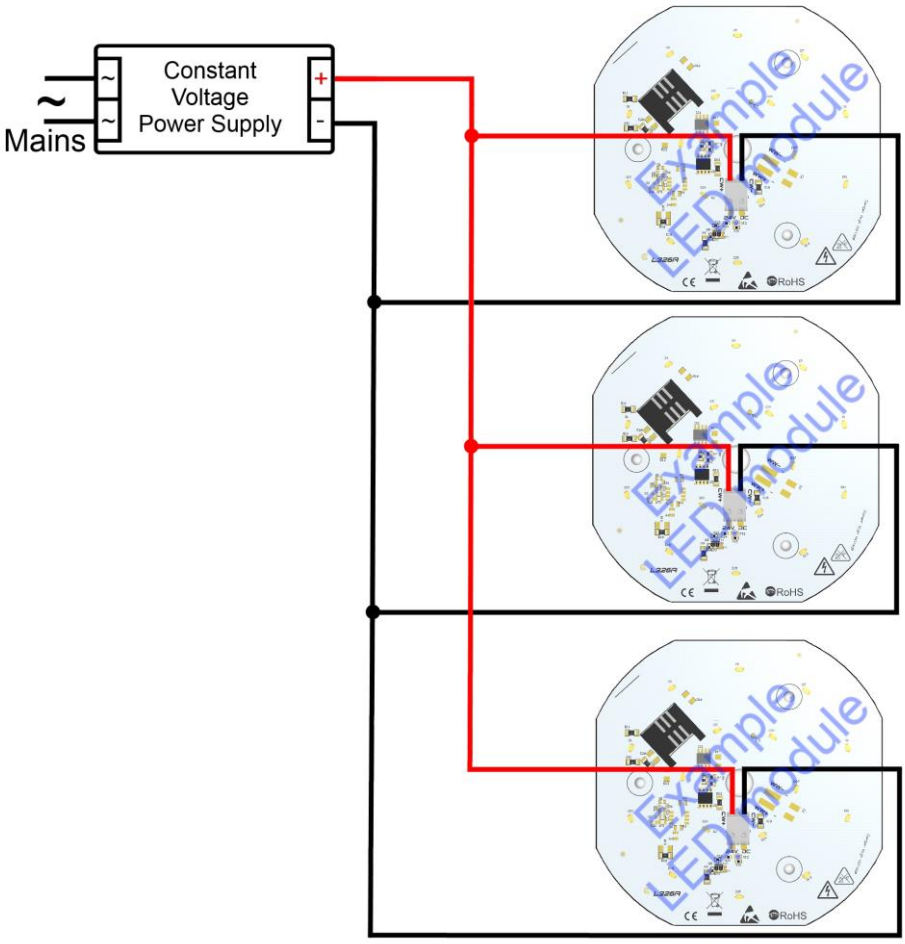
Most of LEDs generate high intensity light even when dimmed. If LED light has high intensity, it is classified as laser. These LEDs must have appropriate marking. Combination of LEDs or even weak LEDs with optics can be very dangerous, because optics can focus beam and looking into LEDs beam is unhealthy and may cause irreversible injury to eye's retina. Never look into the beam without protection glasses with appropriate filter.

Additionally LED light can change intensity almost immediately. If people are photosensitive, LED light may be a trigger to epileptic seizures and alter the perception, especially when light changes very fast.

## CONNECTIONS

Connecting few LED modules allows to create complex lighting. Push terminals provide quick installation of the entire lighting system. The LED modules must be operated with power supply that is suitable for LEDs. When connecting a few LED modules use of appropriate power supply is important. Power supply should have sufficient maximum power to maintain all LED modules. Power supply must be connected properly. Wrong polarization can destroy modules in very short time. We are not responsible for any loss, or damage resulting from improper use of modules! Guarantee become void in such cases. Modules can be operated using a LED controller. It allows to use light effects, dimmer, etc. Thanks to dimmer it is possible to eliminate almost immediately change of light intensity. It is possible because LEDs are full controlled. Slower changes of light intensity are more safety for people with photosensitivity. We have got several different dimmers like touchable, RC, IR and Bluetooth in our offer. Most controllers have many light effects such as fire, thunderstorm, rainbow changes, strobe, etc. Some of these allow to create new effects, that are programmable via software.

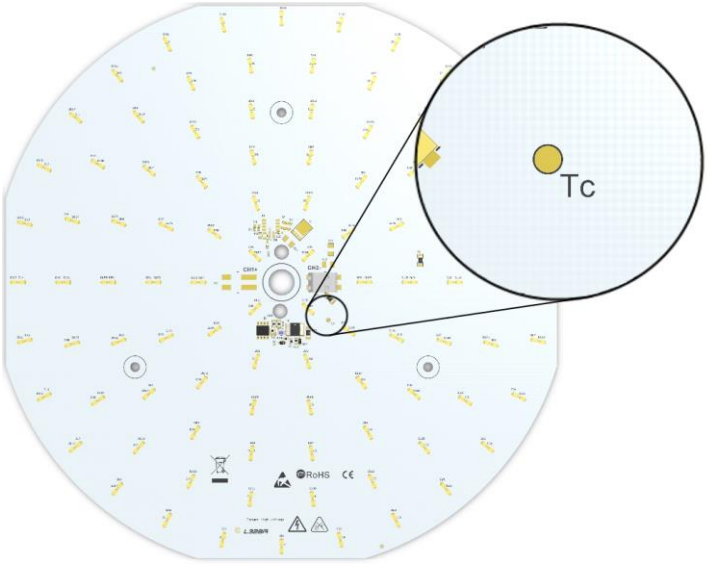
## WIRING DIAGRAM FOR LED CV MODULES WITH PARALLEL WIRING



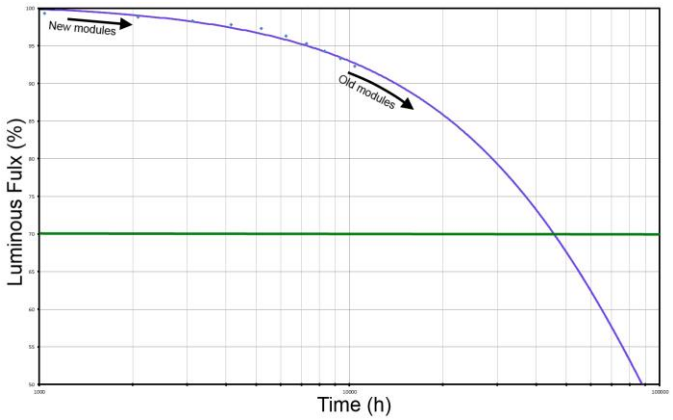

Advantages of this solution is very low voltage of power supply and uniform distribution of light. It meets requirements of SELV. Higher current supply is required to proper operation. Higher current increases temperature and decreases lifetime. Connecting LED CV modules with serial wiring is unacceptable. Such connection may damage or destroy modules. We are not responsible for any loss, or damage resulting from improper use of modules! Guarantee become void in such cases. Above connections are example and may be different from the actual. Above connection is example and may be different from the actual.

## COOLING

The modules are usually self-cooling but if temperature on $T_c$ point exceeds 70°C, then a heat-sink is required. Temperature test point ($T_c$) for measurement should be localized in the middle of the board near LED's thermal pad. The temperature at the $T_c$ point can be measured with thermocouple or simple temperature probe. Example of $T_c$ point is shown on the photo below.

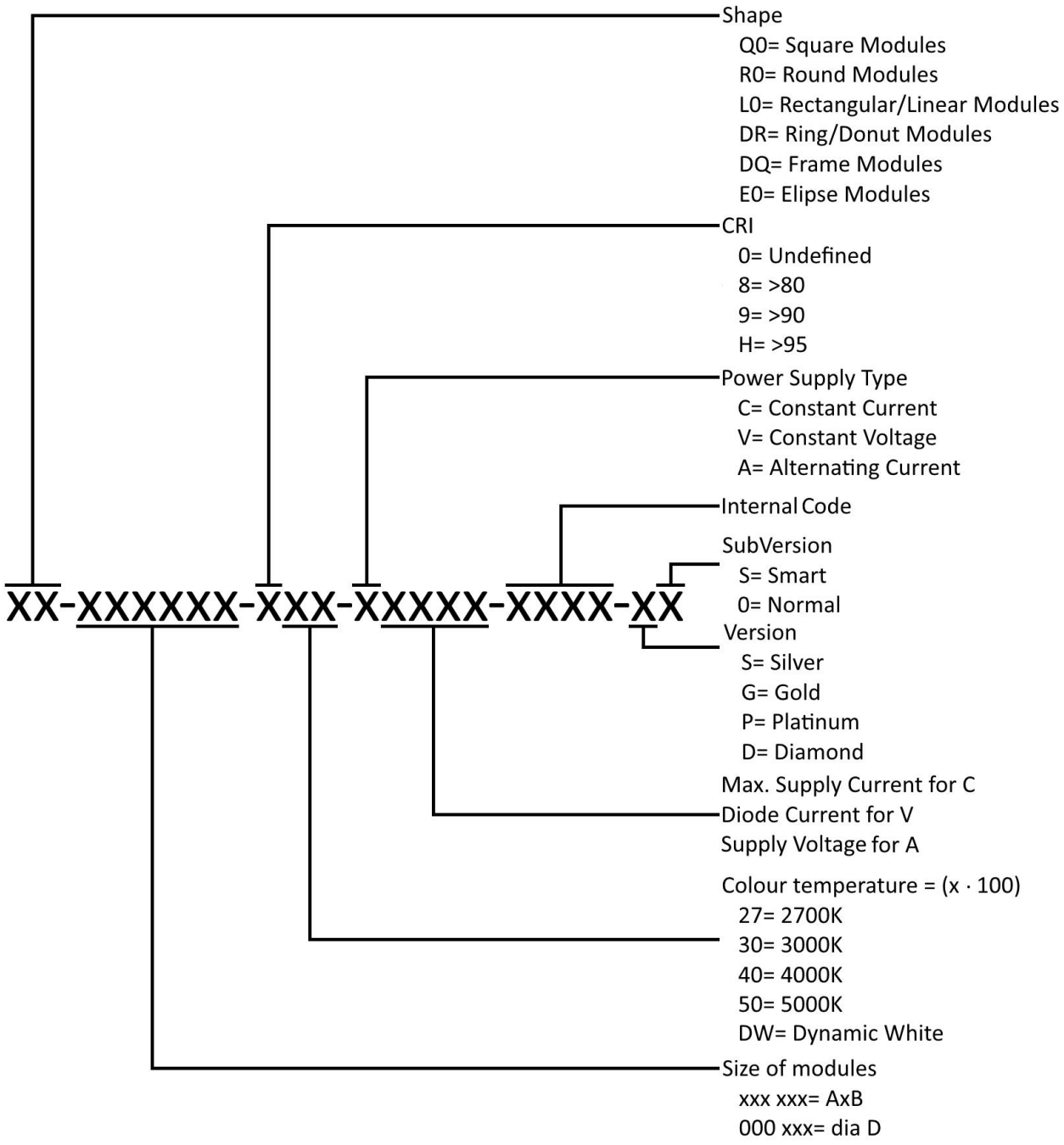



The lifetime of the module depends to operating temperature and used LEDs. If temperature at $T_c$ will be lower than 65°C, the value of luminous flux shouldn't be less than 80% of its nominal value after 50.000h. If temperature is too high then lifetime can be significantly decreased or damage LEDs. Another disadvantage of high temperature is reduction of relative luminous intensity. LED modules produces heat. They must be provided with good air ventilation. Modules without air ventilation can overheat. Overheat can damage or destroy some elements or entire LED modules. We are not responsible for any loss, or damage resulting from improper use of modules! Guarantee become void in such cases.




Most common problem using new modules in old installation is differences in brightness of modules. This is result of luminous flux degradation over time of use. Degradation is normal effect and applies to all LEDs. This effect is different for each LEDs and can be only predicted by testing and estimation. It is complicate issue that mostly depends on temperature and current. Good solution to this problem is reduce of current in new modules, but degradation will be different for each modules. Above characteristic is examples for LEDs in temperature above 100°C and different from the actual.

**DESCRIPTION OF ARTICLE NUMBER**




Above description of article number is standard for white modules, but it may be different. If modules doesn't have any version or subversion, than last two position are skipped. RGB/RGBW modules have in places of CRI written "R" and modules without white LEDs have "GB" in colour temperature. Additionally position of version is skipped.

Silver version – Standard LED modules with optimal number of LEDs. Based on very efficient mid power LEDs with high lm/W even for constant voltage modules.

Gold version – Standard LED modules with double number of LEDs, so modules supply by two times smaller current than Silver version, generate similar luminous flux. This significantly increase lifetime of LEDs. Based on very efficient mid power LEDs with high lm/W even for constant voltage modules

Platinum version – Standard LED modules with optimal number of LEDs. Based on LEDs with increased view angle and higher maximum current on chip, than Silver and Gold version, so they have modules luminous flux.

Diamond version – Standard LED modules with double number of LEDs, so modules supply by two times smaller current than Platinum version, generate similar luminous flux. This significantly increase lifetime of LEDs. Based on LEDs with increased view angle and higher maximum current on chip, than Silver and Gold version, so modules have better luminous flux.

Smart subversion – They are LED modules with mounted SIM slot on board. It provide possibility to equip LED light sources with additional driver, that is compatible with SIM slot. These drivers allow to control modules directly on board. Controllers specially design for this solution are very small and can use almost all wireless standards like Bluetooth, ZigBee or radio, also they may be controlled by motion, proxy sensor etc. Drivers are design to be compatible with as many as possible types of modules. Without driver in SIM slot LED modules are working like normal modules. This version is available only for modules with current stability like Constant Voltage, Dynamic White CV, RGB and RGBW.

Normal subversion – LED modules without additional SIM slot.

## STANDARDS AND DIRECTIVES

In the process of designing and manufacturing the following standards and directives were taken into account:

• 2014/35/EU – Low-voltage Directive: on the harmonisation of the laws of the Member States relating to the making available on the market of electrical equipment designed for use within certain voltage limits

• 2014/30/EU – EMC Directive: on the harmonisation of the laws of the Member States relating to electromagnetic compatibility

• 2011/65/EC – RoHS Directive: restriction of hazardous substances in electrical and electronic equipment

• EN 62031:2010/A1:2013-06 – Safety requirements for LED modules

• EN 60598-1:2015-04 – General requirements and tests for luminaires

• EN 60598-2-2:2012 – Luminaires - Part 2. Special requirements; Main section 2: Recessed luminaires

• EN 62471:2010 – Photo-biological safety of lamps and lamps systems

• EN 61347-1:2015-09 – General and safety requirements

• EN 61347-2-13:2015-04 – Special requirements for DC and AC powered electronic operating equipment for LED modules

• EU Regulation No: 874/2012 – Energy labelling of electrical lamps and luminaries

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Subject to technical changes and errors.