

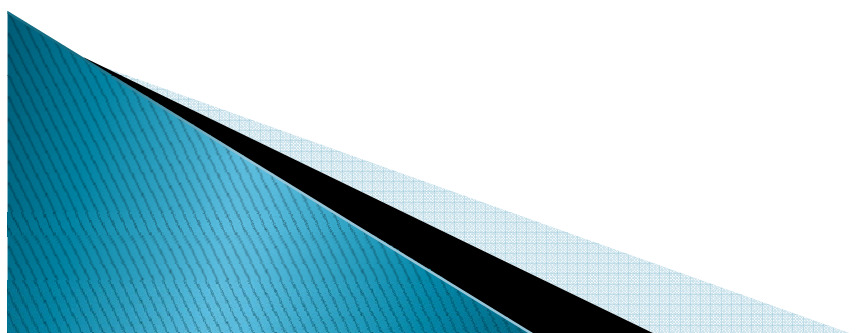
15W Class LED Module User Manual

Model : LLDMWW0-15K902A



Table of Contents

1. Product Description	.....	1
2. Specification	.....	2
3. LED Module Instruction Manual	.....	10
4. Applications	.....	11
5. Warranty	.....	12
6. Ordering Information	.....	13
Appendix. A. Derived Models	.....	14
Appendix. B. LED Package Properties	.....	15
Appendix. C. Thermal Management	.....	17
Appendix. D. Module applied with asymmetry Lens Instruction Guide	.....	21



1. Product Description

- ◆ The product is a LED module used for outdoor lights which is designed to endure in severe conditions such as, extremely high and low temperature, and highly humid condition, even to operate in the water.
- ◆ The LED Module also can be applied with 7 Variety-Lens depending on distribution type of light in the field of outdoor light application.
- ◆ Convertor (LED Driver) is required to operate the LED module and it should be satisfied with electrical and mechanical requirements for proper operation of the module.

Before forcing to operate the LED modules with a convertor, LED module specifications such as, Forward Voltage and Current should be considered. Furthermore, how many LED modules are being used, what is total voltage, what is total current and how the modules are connected(series or parallel) should be considered to choose a proper convertor.

- ◆ Heat management of the LED module is very important since it determines the product life time. Therefore, an optimized heatsink attached to the module is one of the essential component for LED luminaires to ensure their proper operation. For more information, refer to **Appendix. C.**

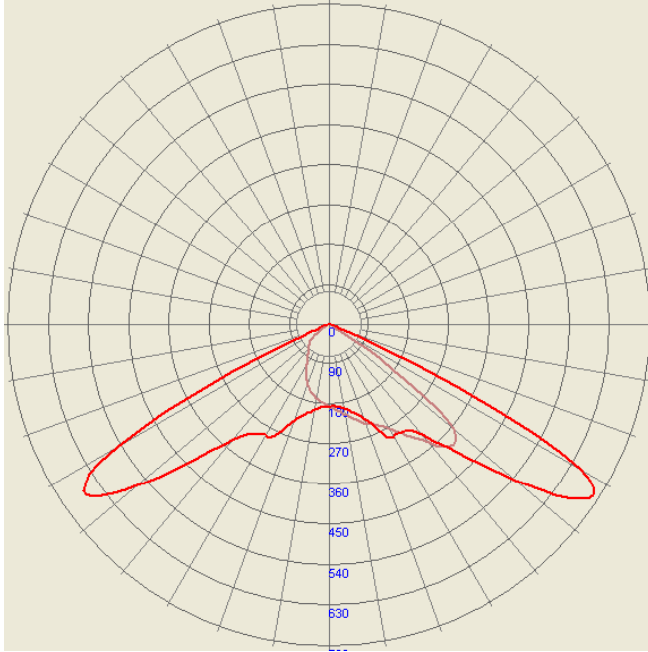
2. Specification

Items		Unit	Specification			Remarks
Module Spec.	Input Current	mA	Min	Typ	Max	DC
			-	500	-	
	Color Temperature	K	6530			± 510
	LED Q'TY	EA	8			
	Forward Voltage	V	24			± 10%
	Total Luminous flux	Lm	1000↑			
	Luminous efficiency	lm/W	80 ↑			
	Storage Temperature	°C	- 40 ~ 80			
	Operating Temperature	°C	- 40 ~ 50			
	Weight	g	92 ± 3%			Connector not included
	Power Consumption (VDC)	W	12			± 10%
	CRI	Ra	70			
	Size	mm	Φ76.5 11.9T			
	Material	-	RoHS Compliance			Halogen Free
	Life Time	hr	50,000 ↑			Warranty up to 50,000
	IP	-	IP67			
	Standards	-	EN 62031, 62471 UL 8750			CE, UL

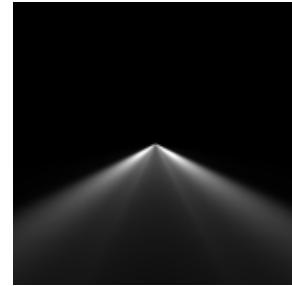
- ◆ Models in the Appendix. A are measured to determine all values above with input current 500mA.
- ◆ All values above are measured by the Integrating Sphere of LG Innotek with EC1000S / WT210.
- ◆ All optic values are measured at 10± 2sec. in the Integrating Sphere.
- ◆ The Max. permitted input current putting into all models in the Appendix. A. is 650mA.
- ◆ CRI values can have tolerances in the range of 3% caused by Measuring Instruments.

◆ Module Specification with Type III lens and 6500K CCT(Base Model)

Type III Lens



Light Distribution



Horizontal view



Vertical view

◆ Beam Angle : H 135 ° V 60°

Table 1. Luminance values depending on Input Current

I _f [mA]	Luminance [lm]	CCT[K]	CRI
500	1000	6500	72
550	1055		
600	1100		
650(Max)	1150		

All Values @ T_c = 65°C

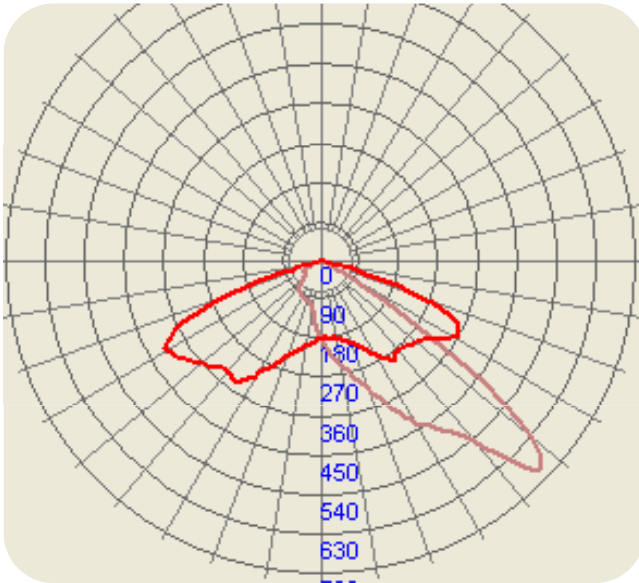
* Values measured by KTR, 2011.5

* All values can have tolerances in the range of 5% caused by Measuring Instruments.

KTR : Korea Testing & Research Institute (Public Approval Institution)

◆ Module Specification with Type II lens and 6500K CCT

Type II Lens



Light Distribution



Horizontal view



Vertical view

◆ Beam Angle : H 160 ° V 70 °

Table 1. Luminance values depending on Input Current

I _f [mA]	Luminance [lm]	CCT[K]	CRI
500	900	6500	72
550	950		
600	990		
650(Max)	1020		

All Values @ T_c = 65°C

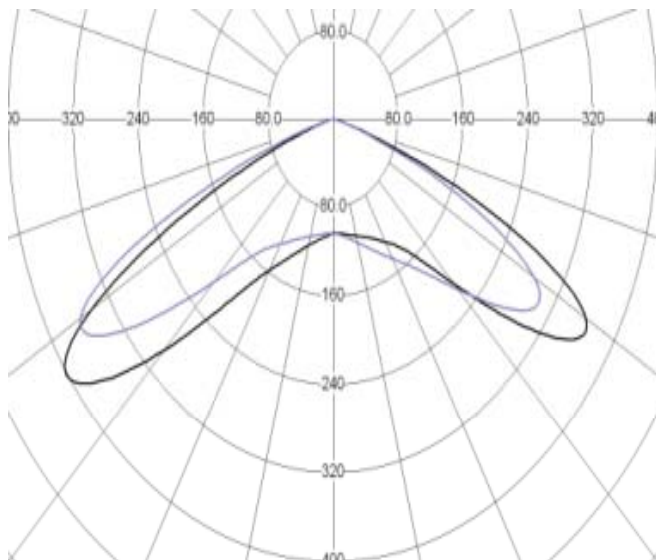
* Values measured by KTR, 2011.5

* All values can have tolerances in the range of 5% caused by Measuring Instruments.

KTR : Korea Testing & Research Institute (Public Approval Institution)

◆ Module Specification with Type V(Sq130°) lens and 6500K CCT

Type V(Sq130°) Lens



Light Distribution



Horizontal view



Vertical view

◆ Beam Angle : H 130 ° V 130 °

Table 1. Luminance values depending on Input Current

I _f [mA]	Luminance [lm]	CCT[K]	CRI
500	1000	6500	72
550	1055		
600	1100		
650(Max)	1150		

All Values @ T_c = 65°C

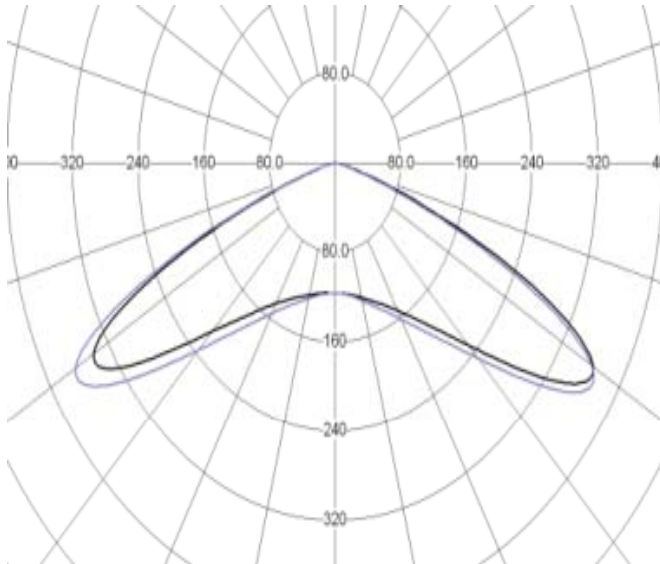
* Values measured by KTR, 2011.5

* All values can have tolerances in the range of 5% caused by Measuring Instruments.

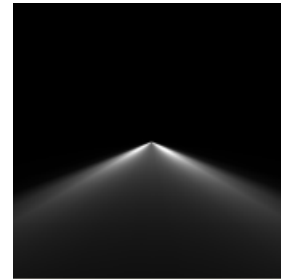
KTR : Korea Testing & Research Institute (Public Approval Institution)

◆ Module Specification with Type V(130°) lens and 6500K CCT

Type V(130°) Lens



Light Distribution



Horizontal view



Vertical view

◆ Beam Angle : H 130° V 130 °

Table 1. Luminance values depending on Input Current

I_f [mA]	Luminance [lm]	CCT[K]	CRI
500	1000	6500	72
550	1055		
600	1100		
650(Max)	1150		

All Values @ $T_c = 65^\circ\text{C}$

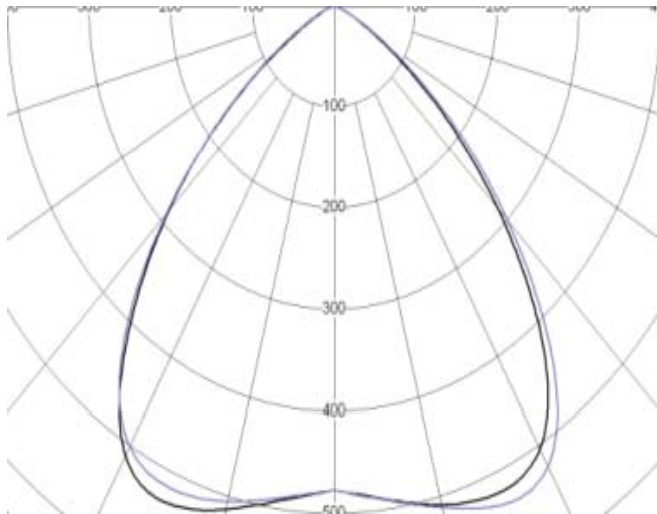
* Values measured by KTR, 2011.5

* All values can have tolerances in the range of 5% caused by Measuring Instruments.

KTR : Korea Testing & Research Institute (Public Approval Institution)

◆ Module Specification with Type V(115°) lens and 6500K CCT

Type V(115°) Lens



Light Distribution



Horizontal view



Vertical view

◆ Beam Angle : H 115° V 115 °

Table 1. Luminance values depending on Input Current

I _f [mA]	Luminance [lm]	CCT[K]	CRI
500	1100	6500	72
550	1180		
600	1250		
650(Max)	1300		

All Values @ T_c = 65°C

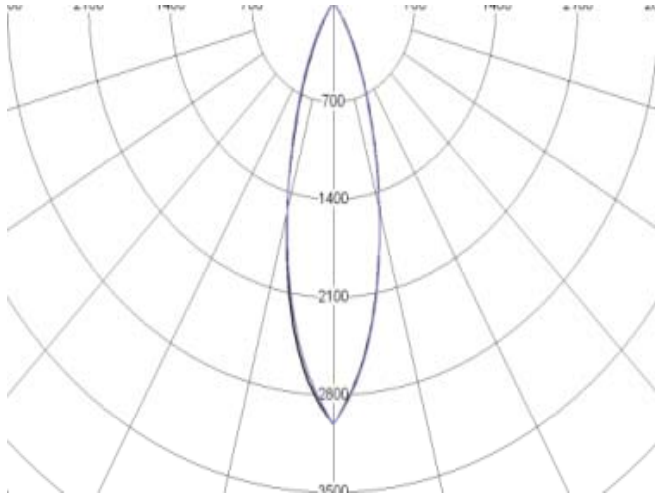
* Values measured by KTR, 2011.5

* All values can have tolerances in the range of 5% caused by Measuring Instruments.

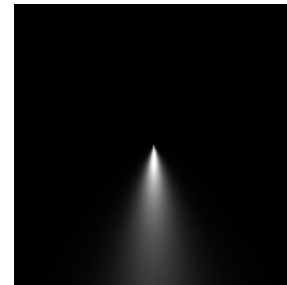
KTR : Korea Testing & Research Institute (Public Approval Institution)

◆ Module Specification with Type V(30°) lens and 6500K CCT

Type V(30°) Lens



Light Distribution



Horizontal view



Vertical view

◆ Beam Angle : H 30° V 30°

Table 1. Luminance values depending on Input Current

I _f [mA]	Luminance [lm]	CCT[K]	CRI
500	1100	6500	72
550	1180		
600	1250		
650(Max)	1300		

All Values @ T_c = 65°C

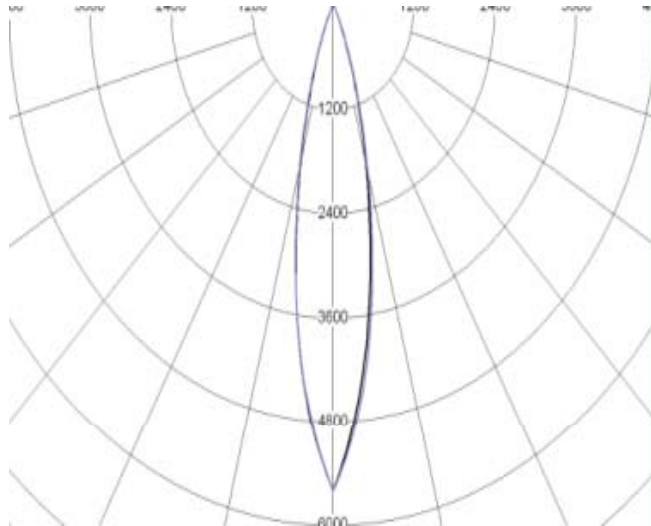
* Values measured by KTR, 2011.5

* All values can have tolerances in the range of 5% caused by Measuring Instruments.

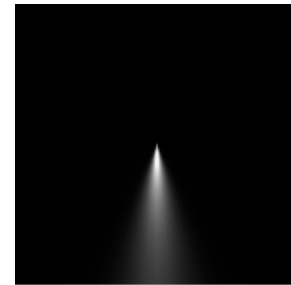
KTR : Korea Testing & Research Institute (Public Approval Institution)

◆ Module Specification with Type V(20°) lens and 6500K CCT

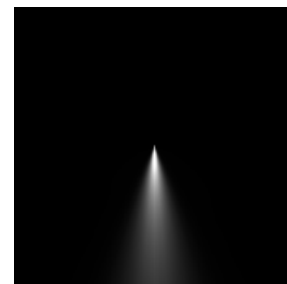
Type V(20°) Lens



Light Distribution



Horizontal view



Vertical view

◆ Beam Angle : H 20° V 20°

Table 1. Luminance values depending on Input Current

I _f [mA]	Luminance [lm]	CCT[K]	CRI
500	1100	6500	72
550	1180		
600	1250		
650(Max)	1300		

All Values @ T_c = 65°C

* Values measured by KTR, 2011.5

* All values can have tolerances in the range of 5% caused by Measuring Instruments.

KTR : Korea Testing & Research Institute (Public Approval Institution)

3. LED Module Instruction Manual

◆ LED Module Installation

- ◆ When the LED module with Type II or III lens is mounted on a heatsink or luminaire, the connector way-out of the LED module should be oriented in a certain direction due to its asymmetric light distribution. Refer to the Appendix D.
- ◆ Combining the LED module with a heat-sink is very important for stable and normal operation of the LED module. There should be no gap between a thermal pad attached on the LED module plate, and the heatsink after they are assembled. Refer to Figure 8. in Appendix C.
- ◆ LED module should be tightly fixed on a heat-sink by fastening bolts.
- ◆ The connector(male) should be correctly linked with another connector(female) from a dedicated convertor. [- : Black wire / + : Gray]

◆ Caution

- ◆ The LED module should not be operated by any unauthorized Power Supply Unit. The LED module must be used only with certain power supplies recommended by LG Innotek or a power which is satisfied for all the values in the Specification on Page 2.
- ◆ Heatsink which takes the thermal energy from the LED module should be tightly attached on the module so that the module temperature, especially at T_c , can keep the condition lower than 70°C .
- ◆ A heat-sink combined with the LED module should not be directly mounted on the perfectly insulated ceiling or wall since it is hard to radiate the heat caused by the LED module. The heat from the LED module must disperse to the surroundings in order to keep the module temperature(T_c) under 70°C .
- ◆ The LED module should be stored in the range of temperature between -40°C and 80°C .
- ◆ The connector or wires, coming from the module, should not be pulled by any forces. It causes that the LED module might not be properly operated.
- ◆ The LED module should not be struck by any physical impacts such as dropping the module into the ground.
- ◆ IP class of the module is IP67 which can protect against the affect of immersion under the water in depth only between 15cm ~ 1m for half an hour.
- ◆ Exceeding the operating current leads to an overload on the LED module. This may result in a significant reduction in product lifetime or even destruction of the LED module. The maximum permissible current is up to 650mA.
- ◆ Do not touch the LED module on purpose during the operation with a Power Supply

4. Applications



Outdoor Module

Sealed outdoor module for multiple applications

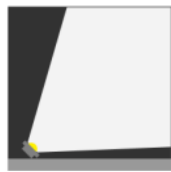


»» Key Features

- Sealed (IP67), suitable for outdoors
- Equipped with a variety of lenses for different light distribution

»» Applications

- Numerous outdoor possibilities



► Flood lighting



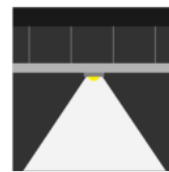
► High bay



► Street Light



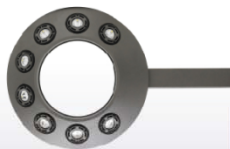
► Bollard



► Raceway



Street Lighting



Area Light



Flood



Spot



Bollard



High Bay



Raceway Cylinder



Raceway Way

5. Warranty

LG Innotek warrants the LED module for a period of five years from the date of sale to the buyer when properly installed on a Heatsink or Luminaire and under normal conditions of use.

The buyer agrees to make all claims regarding defects or deficiencies in the LED module according to the terms of LG Innotek's official warranty. Warranty claims should be made in writing according to LG Innotek procedures.

Valid warranty claims must be made within the warranty period, 5 years, and submitted within seven days of discovery of the damage or defect. Field labor, repair, dismantle, or installation charges are NOT included with this warranty. Any unauthorized return, repair, replacement or modification of the Module shall void this warranty. This warranty does not cover any misapplication or misuse or installation in extremely hazardous or corrosive environments. Contact **LG Innotek (82-31-000-000/ @lginnotek.com)** for complete warranty language, exceptions, limitations, more details.

6. Ordering Information

Item	Option		Code
CCT	3000K		WW
	4000K		NW
	6500K		CW
Lens	Type II (H:135°C V:60°C)		A
	Type III (H:135°C V:60°C)		B
	Type V (Square 130°C)		C
	Type V (Circle 130°C)		D
	Type V (Circle 115°C)		E
	Type V (Circle 30°C)		F
	Type V (Circle 20°C)		G
Connector	JWPF, waterproof Connector	JST Mfg. Co, Ltd.	U
	No connector	-	N
Cable Length	100mm each		10
	200mm each	LS cable. Co, Ltd.	20
	400mm each		40

Ex) LED Module with Type III lens, Connector, 100mm cable, 6500K PKG

Product Name	CCT	Lens	Connector	Cable Length
Eagle eye	CW	B	U	10



Eagle eye-CW-B-U-10

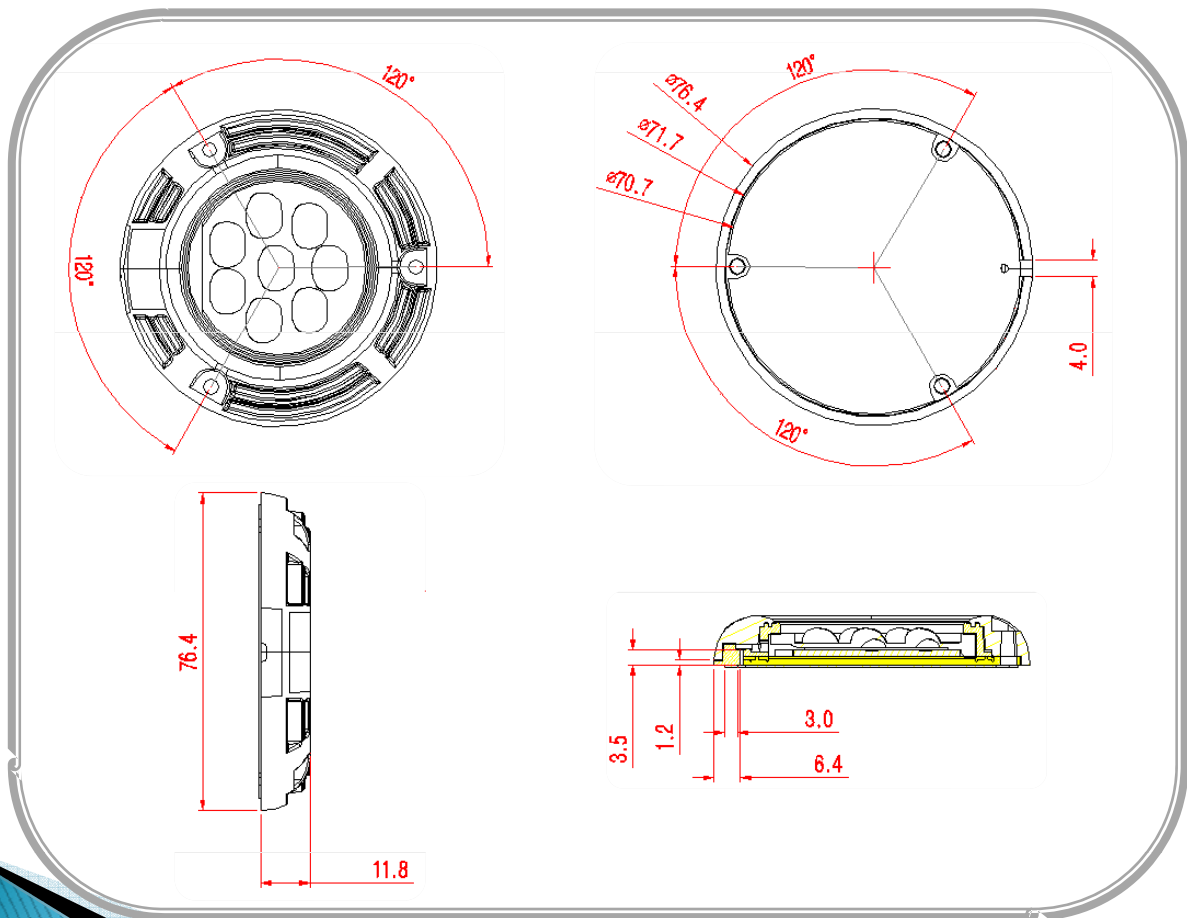
***Red Color : Not available (Developing now in progress)**

Appendix. A. Model Information

1. Model Name

CCT	Lens	Model Name	Remarks
6500K	Type II	LLDMWW0-15K901A	
	Type III	LRD01-11J4A (LLDMWW0-15K902A)	Base Model
	Type V(Sq 130°)	LLDMWW0-15K903A	
	Type V(130°)	LLDMWW0-15K904A	
	Type V(115°)	LLDMWW0-15K905A	
	Type V(30°)	LLDMWW0-15K906A	
	Type V(20°)	LLDMWW0-15K907A	

2. Model Dimension



Appendix. B. LED Package Properties

1. LED PKG Flux Characteristics ($t_j = 25^\circ\text{C}$)

Color	CCT Range		Luminous Flux [lm] @ 350mA	Typical CRI
	Min	Max		
Cool White	5000K	8300K	122	75

2. LED PKG Characteristics

Characteristics	Unit	Typical	Maximum
Thermal Resistance(Junction to Solder Point)	$^\circ\text{C}/\text{W}$	6	75
Viewing Angle	Degrees	125	
Temperature Coefficient of voltage	$\text{mV}/^\circ\text{C}$	-2.1	
ESD Classification (HBM per Mil-Std-883D)	-	Class 2	
DC Forward Current	mA	-	1500
Reverse Voltage	V	-	5
Forward Voltage @ 350mA	V	3.0	3.75
Forward Voltage @ 700mA	V	3.2	
Forward Voltage @ 1000mA	V	3.3	
LED Junction Temperature	$^\circ\text{C}$	-	150

3. LED PKG Characteristic Curve

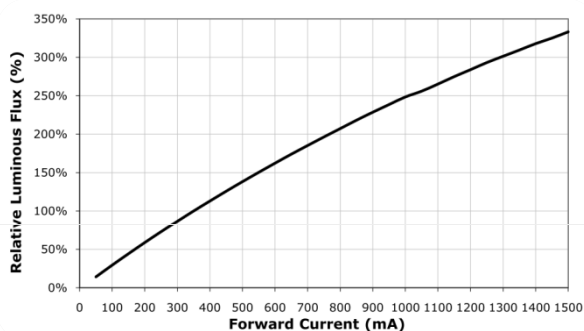


Figure 1. Relative Luminous Flux vs. Current

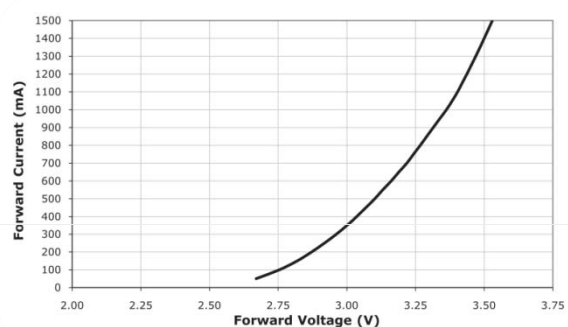


Figure 2. Electrical Characteristics ($T_j = 25^\circ\text{C}$)

4. PKG Multi-Rank Mixing(M.R.M)

- CCT = 6530K $\pm$ 510K

To keep the value of CCT of the LED Module in the specified range, the PKG Rank enclosed with red line in the Figure 9 should be mixed as shown in the Table2. Arrangement of the LED PKG on the Metal PCB is recommended as shown Figure 10.

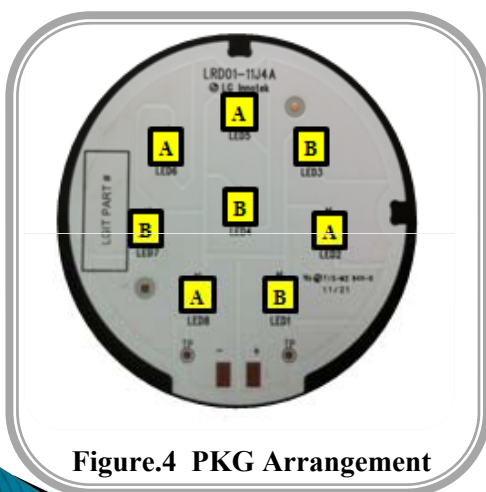
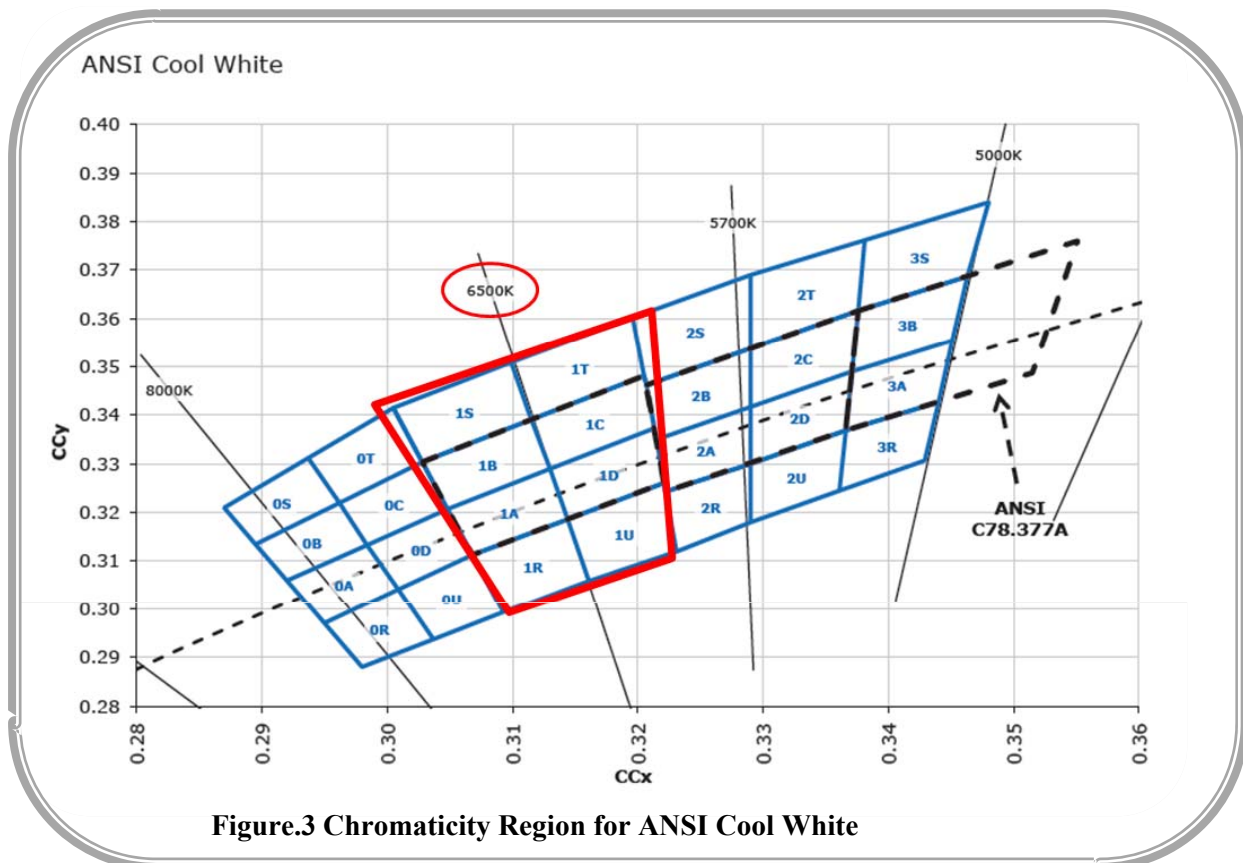


Table1. The Order of Priority for PKG M.R.M

PKG M.R.M	P1	P1	P1	P1	P2	P2	P2	P2	P2	P2
PKG A	1A	1B	1B	1A	1S	1T	1B	1A	1C	1D
PKG B	1D	1C	1D	1C	1U	1R	1U	1T	1R	1S

P1 : The First Order of Priority for PKG M.R.M
P2 : The Second Order of Priority for PKG M.R.M

Appendix. C. Thermal Management

1. Overview

- Since heat-sink design for the module would affect lifetime and performance of the module, a heat-sink or luminaire should be designed with thermal considerations to smoothly dissipate the thermal energy to the ambient.
- End product with the LED module should be designed in a manner which minimizes the thermal resistance from the solder point to ambient in order to optimize the LED module life and its optical characteristics

2. Heat sink Design guide

- The lifetime of the LED module cannot be guaranteed if operated without a heat-sink. The heat-sink should be coupled with the module for thermal management as shown in Figure 9.
- Design of the heat-sink is one of the main factor which determines lifetime and performance of the module. Heat-sink should be designed to keep the module temperature, T_c , under 70°C .
- Recommended material for the heat-sink is metals such as, Aluminum whose conductivity is relatively higher and cheaper than other materials. In addition, surface treatment of the heat-sink is important to increase the rate of heat-transfer. Powder coating and Anodizing might be a good solution for the surface treatment of the heat-sink.



Figure.5 Assembly between Heat-sink(Al) and LED Module

3. Case Temperature & Junction Temperature

- **Junction Temperature(T_j)**

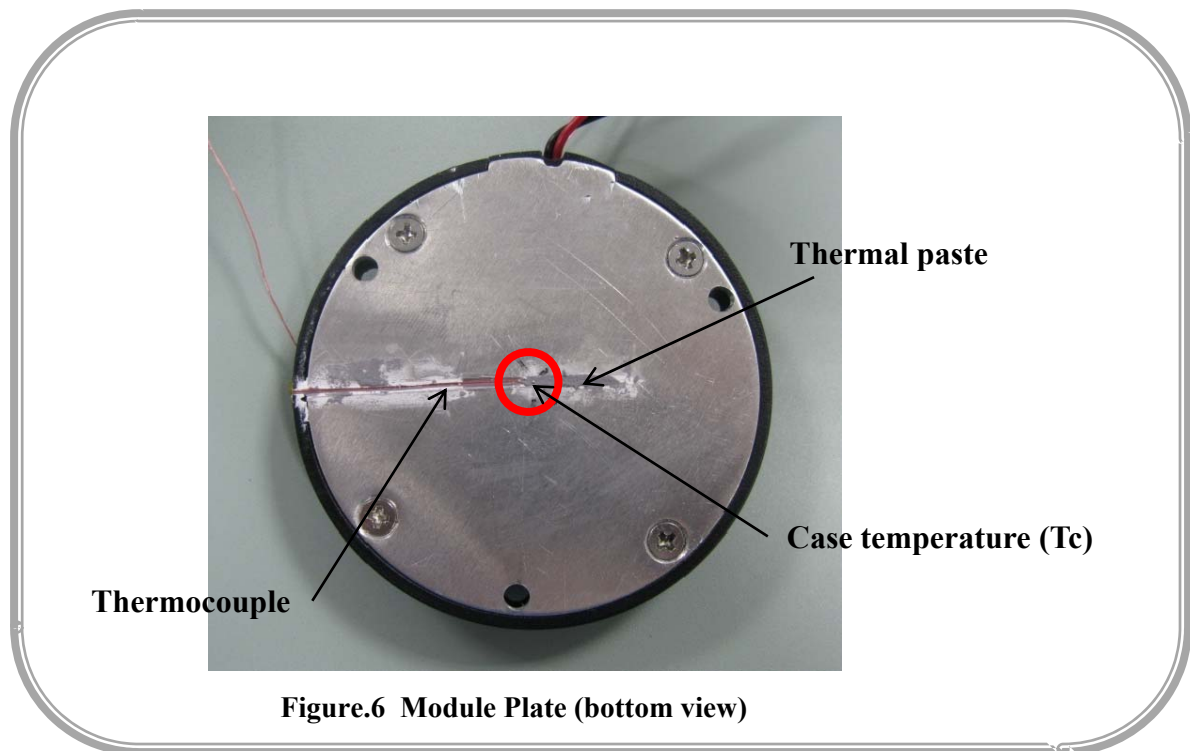
Definition of Junction Temperature(T_j) is internal temperature of a chip at which temperature has the highest value.

Since it is hard to measure Junction Temperature(T_j) at firsthand, the value of the T_j can be assumed by the equation shown in Figure.11 on the next page.

- **Case Temperature (T_c):**

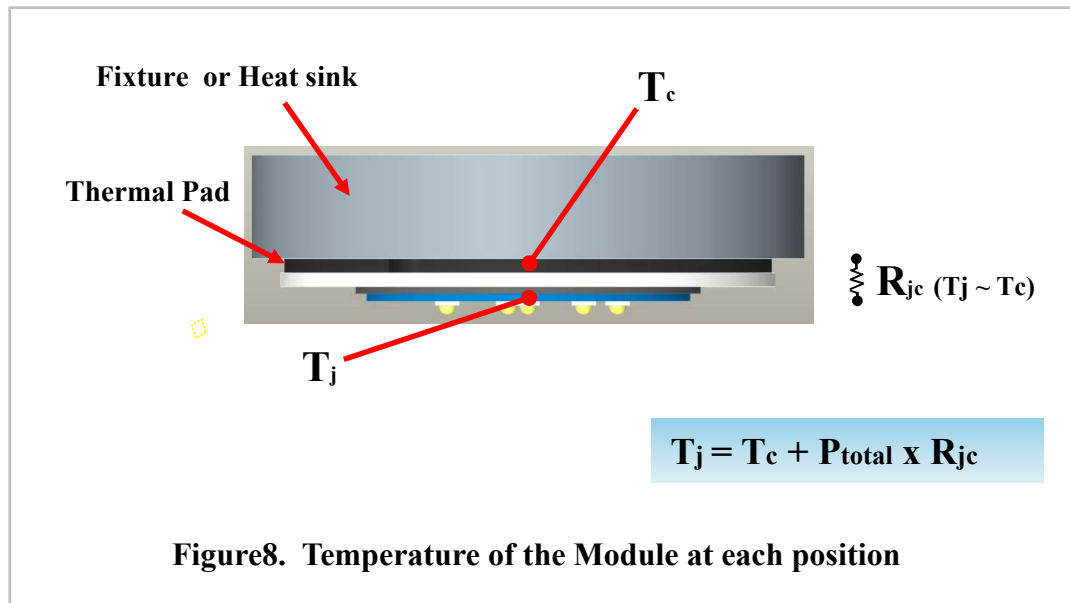
Case Temperature(T_c) is the temperature at the center point of the module plate remarked in Figure 10. It shows how to measure T_c .

*Case Temperature(T_c) should be lower than 70°C while the LED module is operating.



4. Estimation of Junction Temperature (T_j)

- Junction temperature (T_j) could be estimated by the equation below in Figure 11.
- T_c point can be measured as described in Figure 10.



- How to obtain the value of T_j when T_c is measured at 50°C

※ **Basic Equation** $\rightarrow T_j = T_c + P_{total} \times R_{jc}$

- $P_{total} = \text{Typical Input Current} \times \text{Forward Voltage} = 0.5[\text{A}] \times 24.0[\text{V}] = 12.0[\text{W}]$

- $R_{jc} = 1.6 [^\circ\text{C}/\text{W}] \rightarrow \text{The value of Thermal Resistance is obtained by LGIT internal}$

experiment

$\rightarrow \text{ex) } T_j = T_c + R_{jc} \times P_{total} = 50[^\circ\text{C}] + 1.6[^\circ\text{C}/\text{W}] \times 12[\text{W}] = 69.2[^\circ\text{C}]$

5. PKG Property depending on Junction Temperature (Tj)

Current	Ta(°C)	Tsp(°C)	Tj(°C)	L70(hours)
350mA	85	85	91	174,071
1000mA	85	85	105	74,773

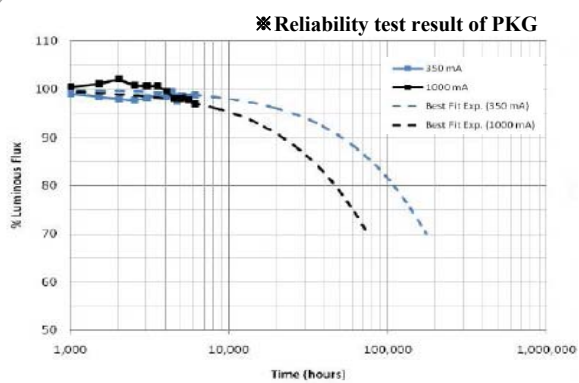


Figure 9. Luminous Flux VS. Time

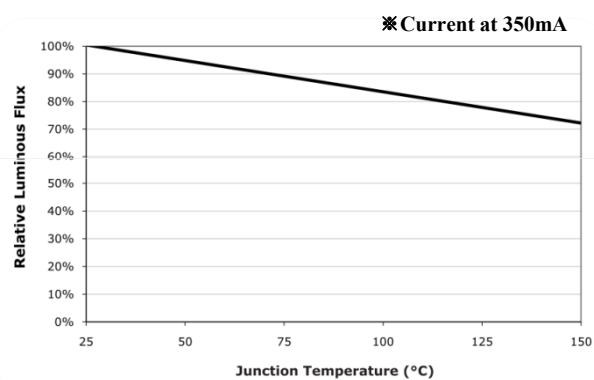


Figure10. Relative Flux VS. Junction Temp.

▪ LED Module Thermal Specifications

Parameter	Min.	Typical	Max.	Unit	Remarks
Tj		90	105	°C	
Tc		70		°C	
Rjc		1.6		°C/W	
L70		50,000		Hours	

Appendix. D. Module with Asymmetry Lens Instruction Guide

Since type II and type III lens have their own light distribution direction, the LED module with a type II or III lens has asymmetry light distribution unlike other lenses. Therefore, intended light distribution should be considered before attaching the LED module on a heatsink or luminaire. As shown below Figure 14, the LED module with type III lens should be mounted correctly in the right direction on the luminaire in order to obtain suitable light distribution on the roadway.

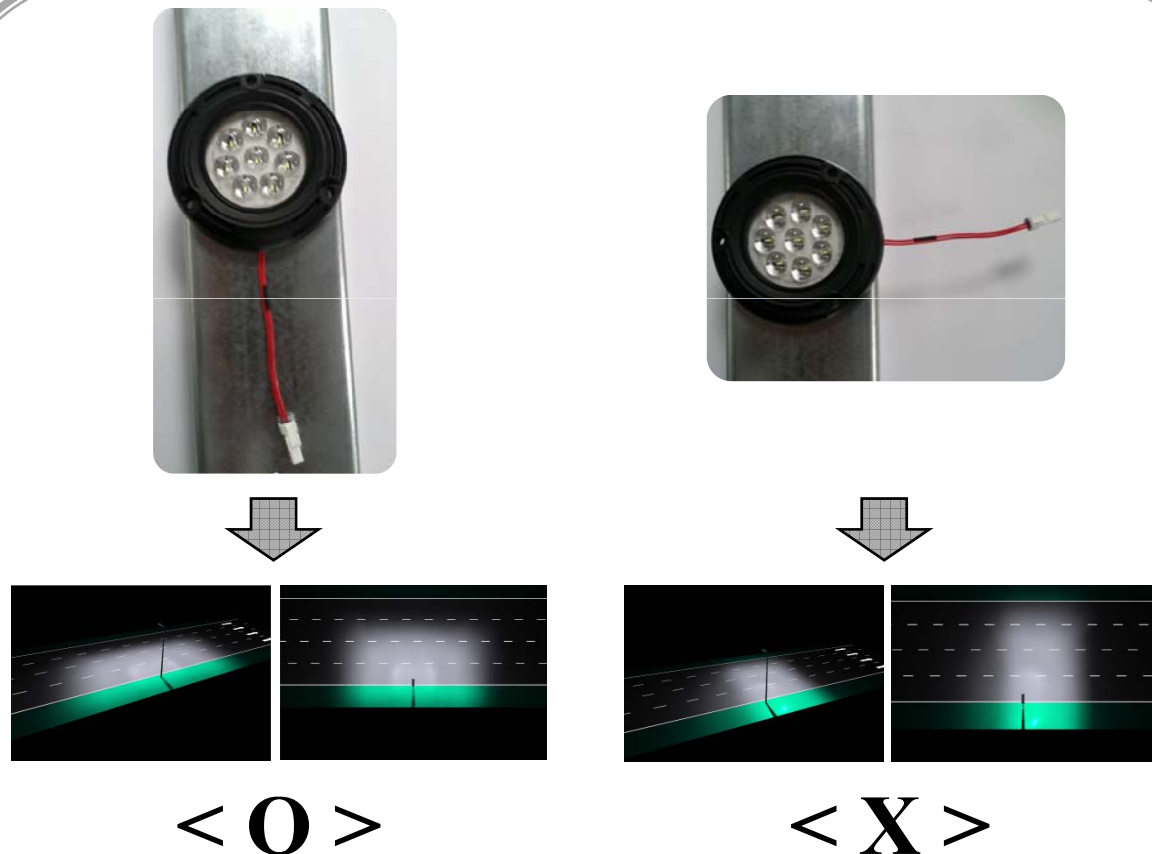


Figure.7 Light distribution on the road surface depending on the LED Module direction

**Simulation image of street light applied by LED modules with Type III lens*