

CUSTOMER : _____.

DATE : 2013. 03. 29.

REV : Rev. 1.0.

PRODUCT DATA SHEET

Eagle Eye Outdoor LED Module

5700K

MODEL NAME : LLDMWW0-15K701A (Type II Lens - H:160° V:70°)

LLDMWW0-15K702A (Type III Lens - H:135° V:60°)

LLDMWW0-15K703A (Type V Lens - Square 130°)

LLDMWW0-15K704A (Type V Lens - Circle 130°)

LLDMWW0-15K705A (Type V Lens - Circle 115°)

LLDMWW0-15K706A (Type V Lens - Circle 30°)

LLDMWW0-15K707A (Type V Lens - Circle 20°)

RoHS
Compliant

HALOGEN
FREE



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1. Introduction

This document describes the 20W class LED module (with integrated optics), which is developed and manufactured by *LG Innotek Co. Ltd.* It covers electrical and mechanical properties as well as general performance parameters of the LED module, including reliability test results based on outdoor conditions.

- An LED module is an electronic device designed to be operated with a constant current LED driver.
- Target applications are outdoor luminaires such as street lights, flood lights, outdoor parking lights, canopy lights and security lights.

2. Product Description

- This product is an LED module designed for luminaires in outdoor environments where the module can endure severe conditions such as extremely high and low temperatures, high humidity and even submerged conditions for up to 30 minutes.
- Four different CCTs (Correlated Color Temperatures) are supported by the LED module. Refer to Appendix B. for more details.
- The LED module supports 7 types of lenses where each type generates a different radiation pattern to target an outdoor application requirement.
- A constant current LED driver is required to properly operate the LED module to meet the electrical and thermal specifications. The LED module parameters such as forward voltage and current should be considered before selecting the LED driver. The number of LED modules, the total voltage, the total current, the circuit (series and/or parallel) topology should also be taken into account before operating the modules with the appropriate LED driver.
- It is essential that the LED modules are attached to a thermal management solution (heat sink) in order to maintain the junction and case temperatures of the LED module at an appropriate level. This will ensure their proper operation as the module lumen maintenance is affected by temperature.

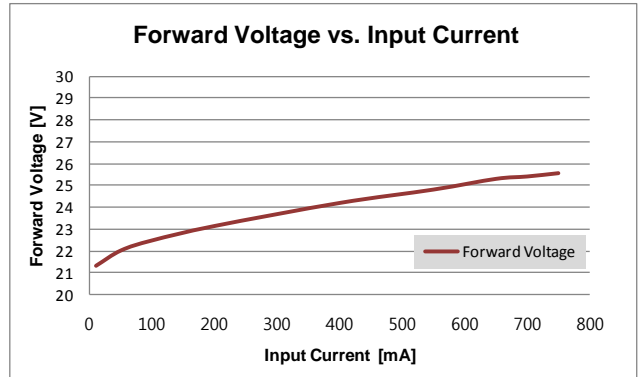
3. Specifications

Items	Unit	Specification	Remarks
Input Current	mA	Up to 750mA	10mA~750mA
LED Quantity	EA	8	-
Forward Voltage	V	Typ. 21.5V (at 10mA) Typ. 26.0V (at 750mA)	Values can vary by input current Tolerance $\pm 15\%$ at 750mA
Luminous Flux	lm	Refer to each lens Specifications	Values can vary by lens type
Luminous Efficacy	lm/W	Refer to each lens Specifications	Values can vary by lens type
Color Temperature	K	5700K	-
Color Coordinates Center Point	-	Cx = 0.3280, Cy = 0.3417	-
Color Consistency (SDCM)	Step	Max. 7	-
CRI	-	Min. 70	-
Storage Temperature	°C	- 40 ~ 80	-
Operating Temperature	°C	- 40 ~ 50	-
Case Temperature	°C	Max. 70	-
Weight	g	88 \pm 5%	Connector not included
Power Consumption	W	Up to 20W	Values can vary depending on input current Tolerance $\pm 15\%$ at 750mA
Size	mm	$\varnothing 76.5 \times H_1 12.3$ $\varnothing 76.5 \times H_2 13.7$	H ₁ : Type II, Type III, Type V(Sq.130°), Type V(130°), Type V(115°) H ₂ : Type V(30°), Type V(20°)
Material	-	RoHS Compliant	Halogen Free
IP	-	IP67	-
Standards	-	EN 62031, EN62471, UL 8750	CE, UL Recognized

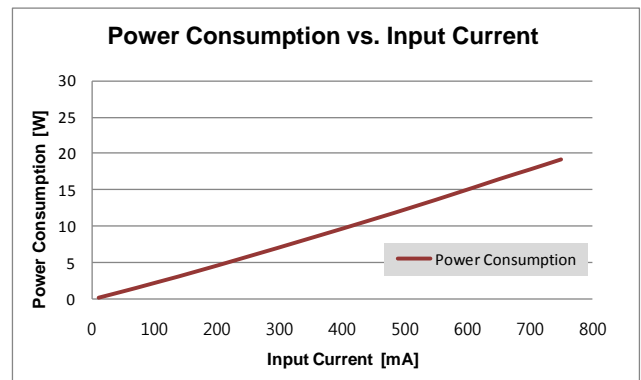
- The qualified maximum input current for all models in Appendix B. is 750mA.
- CCT and x, y chromaticity coordinates (CIE 1931) can vary with the input current.
- Measurement Tolerance Range (Measurement equipment, Measurement process, Human error)
 - CRI : $\pm 3\%$, CCT : $\pm 2\%$, Luminous Flux : $\pm 5\%$, CIE 1931 x, y Chromaticity Coordinates : ± 0.005 , Forward Voltage (Vf) : $\pm 0.8V$, Beam Angle : $\pm 5^\circ$
- H₁), H₂) : Refer to page 14 for more details.

3. Specifications

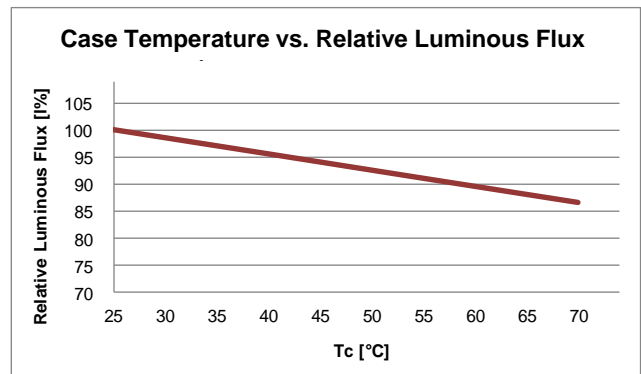
- Forward Voltage vs. Input Current



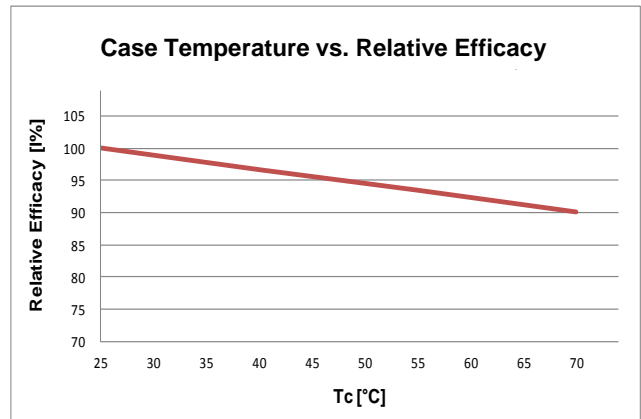
- Power Consumption vs. Input Current



- Case Temperature vs. Relative Luminous Flux

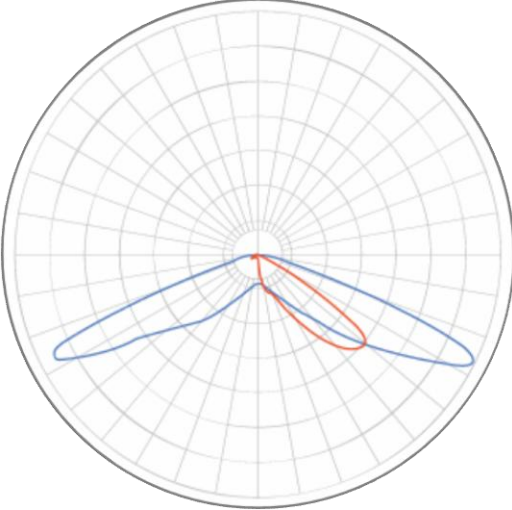
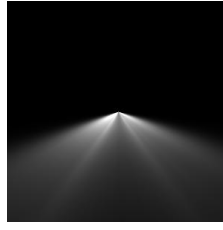



- Case Temperature vs. Relative Efficacy



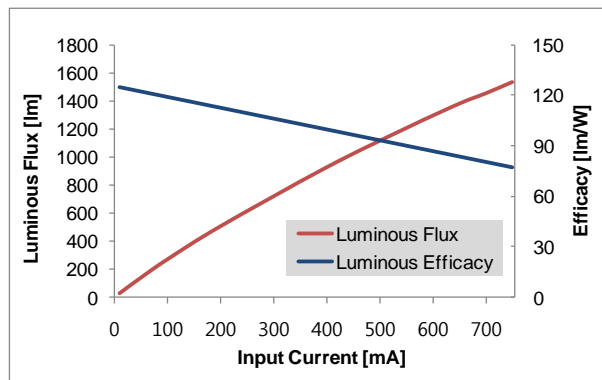
3. Specifications

3.1. LLDMWW0-15K701A (Type II Lens - H:160° V:70° / 5700K)

Light Distribution	Beam Angle (H160° V70°)	Application
	 Horizontal view	Street Lighting
	 Vertical view	

Items		Min.	Typ.	Max.	Condition
Forward Voltage	V	22.5	25	27.5	Input Current : 650mA Tc : 25°C
Total Luminous Flux	lm	1287	1430	-	
Luminous Efficacy	lm/W	81.9	91	-	
Power Consumption	W	13.6	16	18.4	

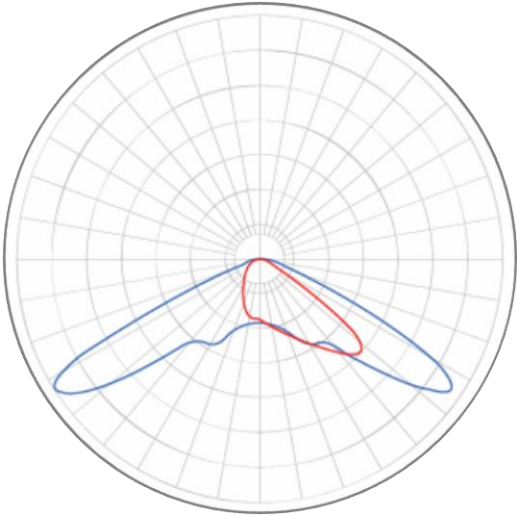
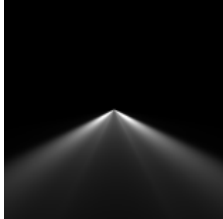

• Luminous Flux and Luminous Efficacy



• All photometric values are measured at 10±2 seconds in the LG Innotek integrating sphere.

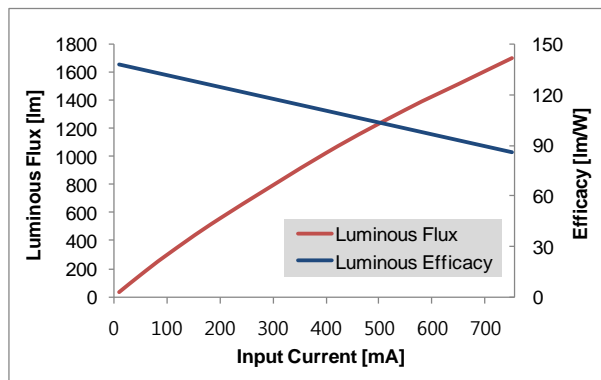
3. Specifications

3.2. LLDMWW0-15K702A (Type III Lens - H:135° V:60° / 5700K)

Light Distribution	Beam Angle (H135° V60°)	Application
	 Horizontal view	Street Lighting
	 Vertical view	

Items		Min.	Typ.	Max.	Condition
Forward Voltage	V	22.5	25	27.5	Input Current : 650mA Tc : 25°C
Total Luminous Flux	lm	1422	1580	-	
Luminous Efficacy	lm/W	88.2	98	-	
Power Consumption	W	13.6	16	18.4	

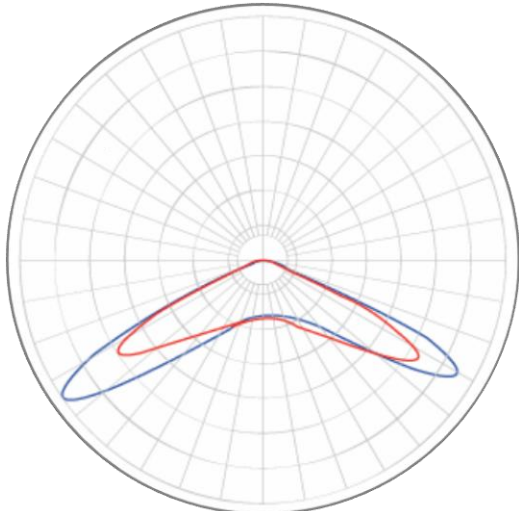
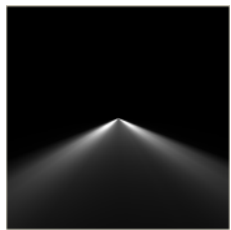
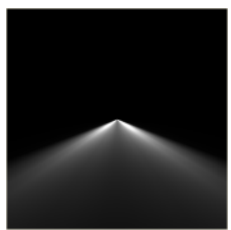
• Luminous Flux and Luminous Efficacy



• All photometric values are measured at 10±2 seconds in the LG Innotek integrating sphere.

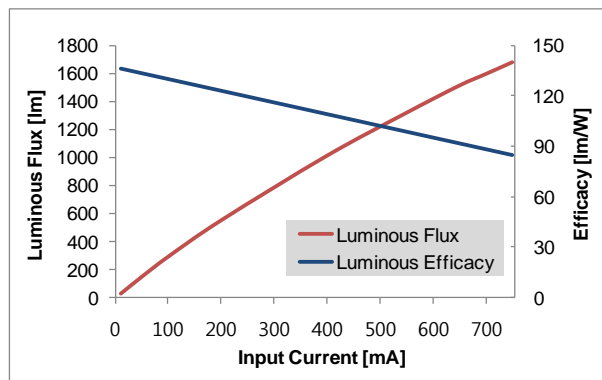
3. Specifications

3.3. LLDMWW0-15K703A (Type V Lens - Square 130° / 5700K)

Light Distribution	Beam Angle (Square 130°)	Application
	 Horizontal view	Security Lighting Parking Lot Lighting Canopy Lighting
	 Vertical view	

Items		Min.	Typ.	Max.	Condition
Forward Voltage	V	22.5	25	27.5	Input Current : 650mA Tc : 25°C
Total Luminous Flux	lm	1395	1550	-	
Luminous Efficacy	lm/W	87.3	97	-	
Power Consumption	W	13.6	16	18.4	

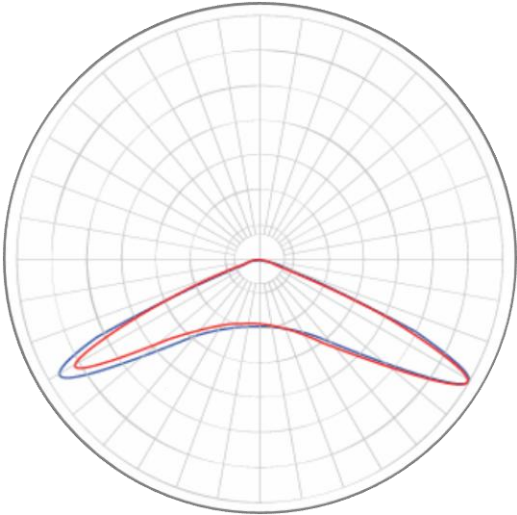
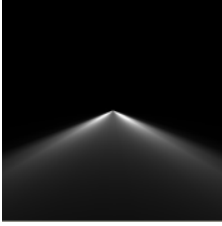
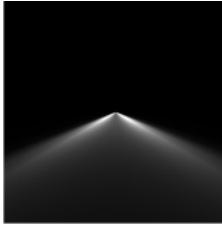
• Luminous Flux and Luminous Efficacy



• All photometric values are measured at 10±2 seconds in the LG Innotek integrating sphere.

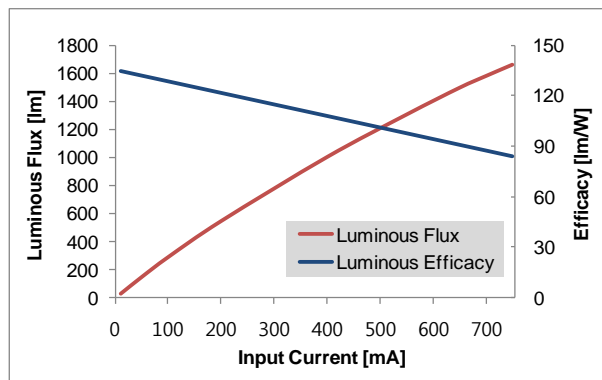
3. Specifications

3.4. LLDMWW0-15K704A (Type V Lens - Circle 130° / 5700K)

Light Distribution	Beam Angle (Circle 130°)	Application
	 <p>Horizontal view</p>	Security Lighting Parking Lot Lighting Canopy Lighting
	 <p>Vertical view</p>	

Items		Min.	Typ.	Max.	Condition
Forward Voltage	V	22.5	25	27.5	Input Current : 650mA Tc : 25°C
Total Luminous Flux	lm	1395	1550	-	
Luminous Efficacy	lm/W	87.3	97	-	
Power Consumption	W	13.6	16	18.4	

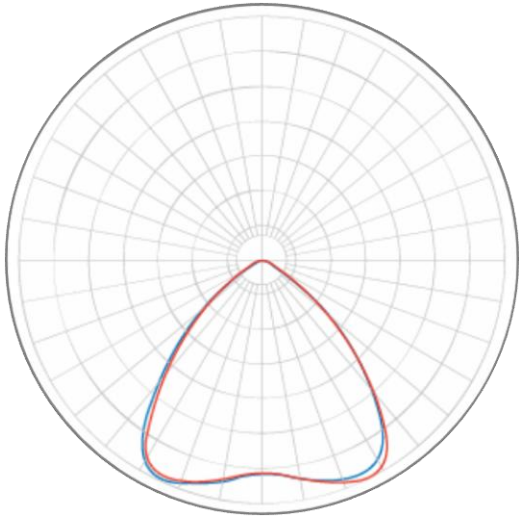


• Luminous Flux and Luminous Efficacy



• All photometric values are measured at 10±2 seconds in the LG Innotek integrating sphere.

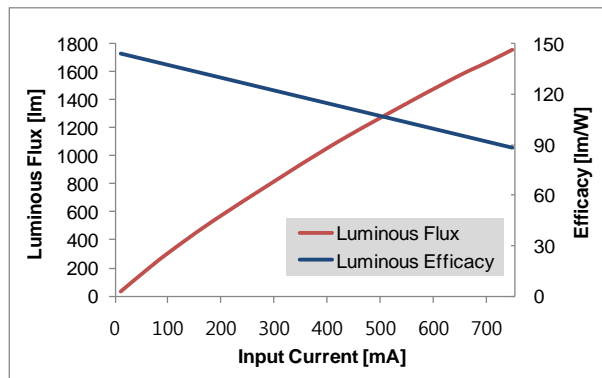
3. Specifications

3.5. LLDMWW0-15K705A (Type V Lens - Circle 115° / 5700K)

Light Distribution	Beam Angle (Circle 115°)	Application
	 Horizontal view	Security Lighting Parking Lot Lighting Canopy Lighting
	 Vertical view	

Items		Min.	Typ.	Max.	Condition
Forward Voltage	V	22.5	25	27.5	Input Current : 650mA Tc : 25°C
Total Luminous Flux	lm	1485	1650	-	
Luminous Efficacy	lm/W	92.7	103	-	
Power Consumption	W	13.6	16	18.4	

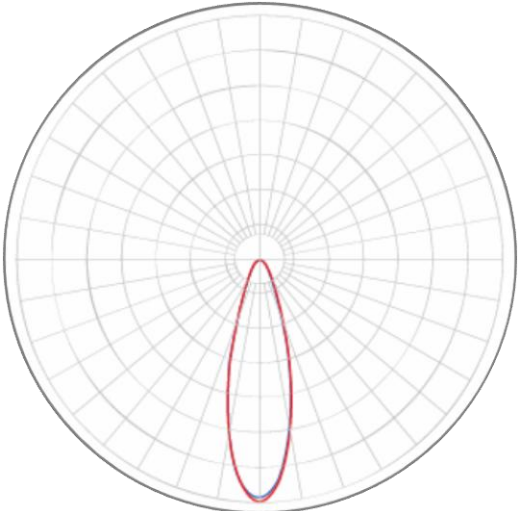
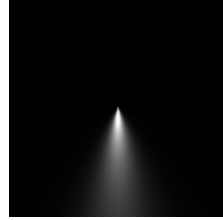
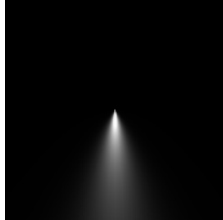
• Luminous Flux and Luminous Efficacy



• All photometric values are measured at 10±2 seconds in the LG Innotek integrating sphere.

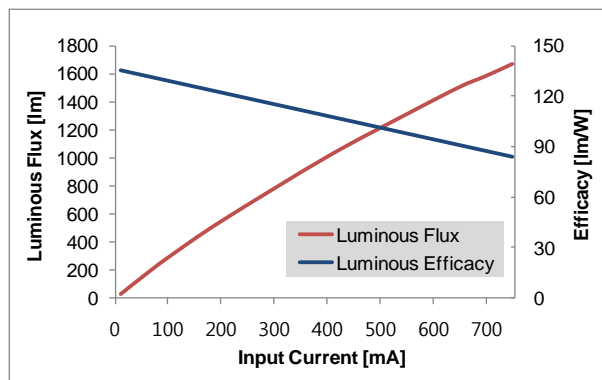
3. Specifications

3.6. LLDMWW0-15K706A (Type V Lens - Circle 30° / 5700K)

Light Distribution	Beam Angle (Circle 30°)	Application
	 <p>Horizontal view</p>	Flood Lighting
	 <p>Vertical view</p>	

Items		Min.	Typ.	Max.	Condition
Forward Voltage	V	22.5	25	27.5	Input Current : 650mA Tc : 25°C
Total Luminous Flux	lm	1431	1590	-	
Luminous Efficacy	lm/W	89.5	99.5	-	
Power Consumption	W	13.6	16	18.4	

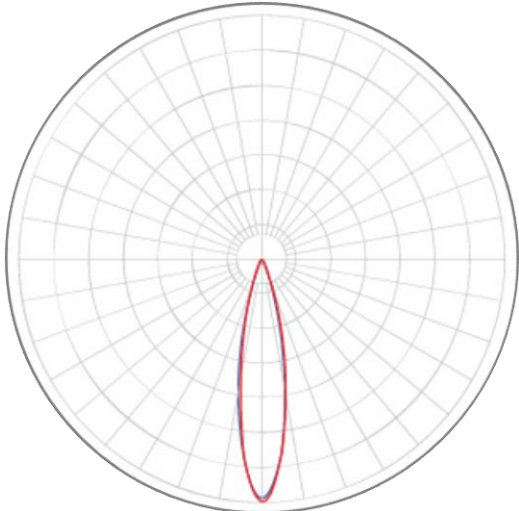
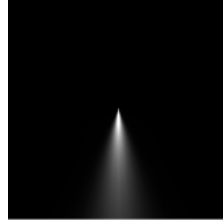
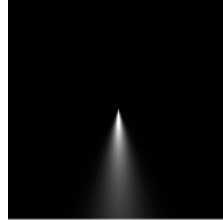
• Luminous Flux and Luminous Efficacy



• All photometric values are measured at 10±2 seconds in the LG Innotek integrating sphere.

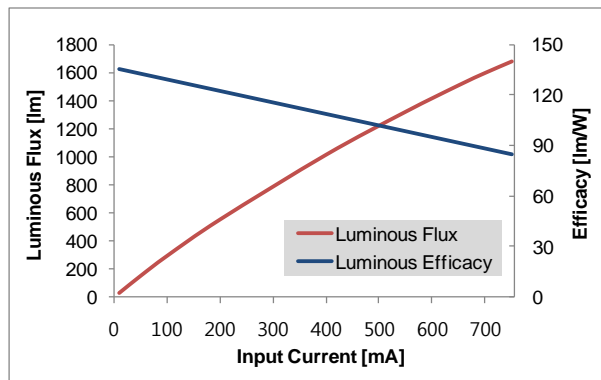
3. Specifications

3.7. LLDMWW0-15K707A (Type V Lens - Circle 20° / 5700K)

Light Distribution	Beam Angle (Circle 20°)	Application
	 <p>Horizontal view</p>	Flood Lighting
	 <p>Vertical view</p>	

Items		Min.	Typ.	Max.	Condition
Forward Voltage	V	22.5	25	27.5	Input Current : 650mA Tc : 25°C
Total Luminous Flux	lm	1422	1580	-	
Luminous Efficacy	lm/W	88.6	98.5	-	
Power Consumption	W	13.6	16	18.4	

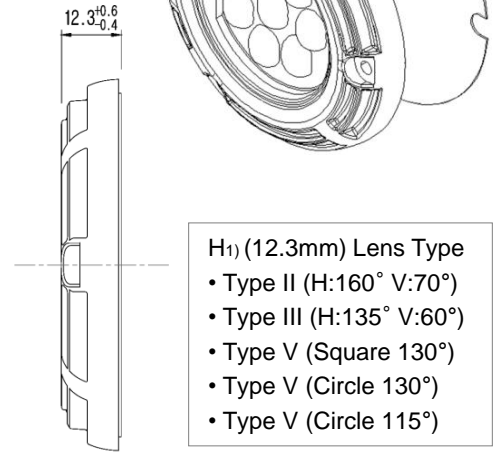
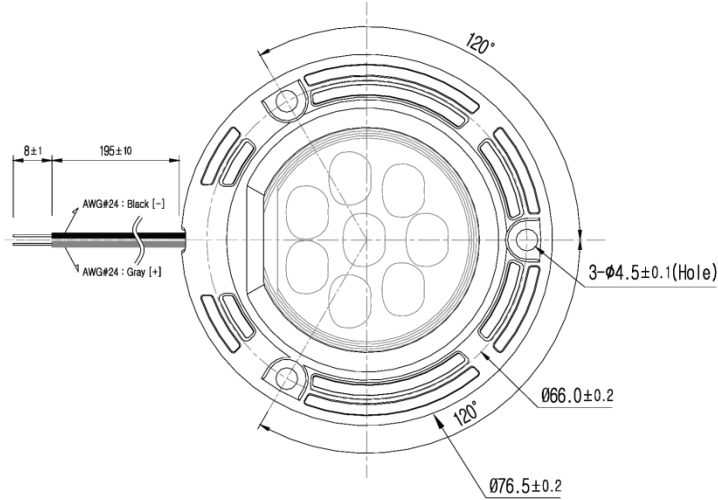
• Luminous Flux and Luminous Efficacy



• All photometric values are measured at 10±2 seconds in the LG Innotek integrating sphere.

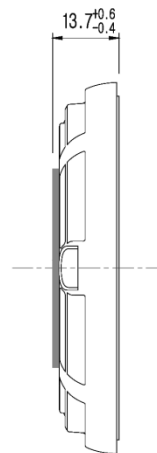
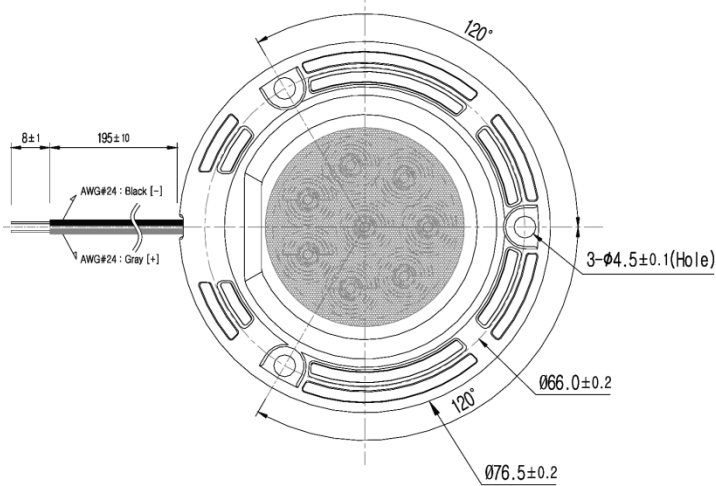
4. LED Module Drawings (Unit : mm)

• Module Drawing (Lens Type III H:135° V:60°)



- H₁ (12.3mm) Lens Type
- Type II (H:160° V:70°)
 - Type III (H:135° V:60°)
 - Type V (Square 130°)
 - Type V (Circle 130°)
 - Type V (Circle 115°)

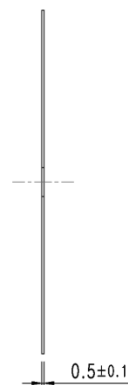
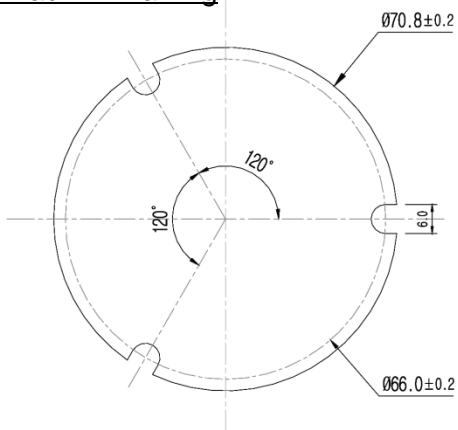
• Module Drawing (Lens Type V Circle 30°)



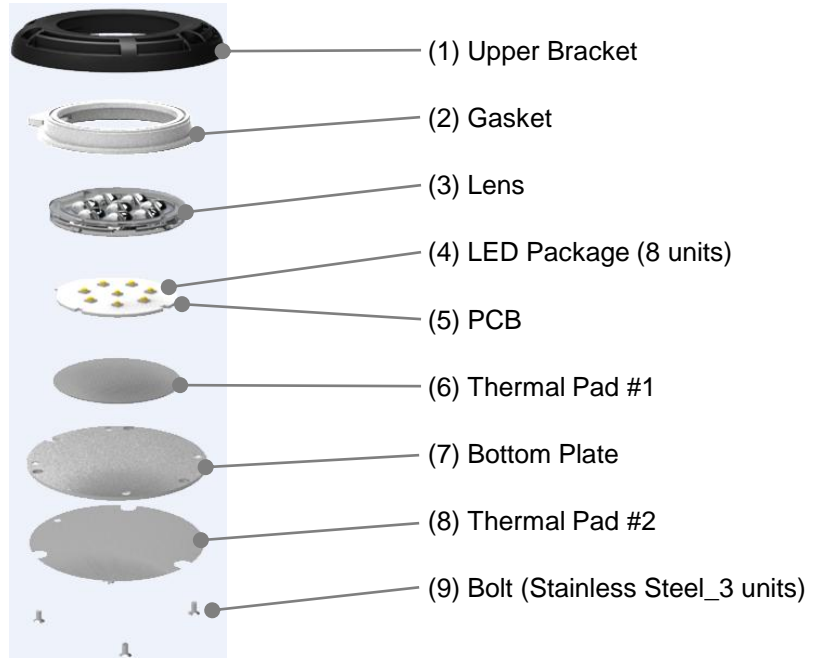
- H₂ (13.7mm) Lens Type
- Type V (Circle 30°)
 - Type V (Circle 20°)

• Additional drawings by lens type is included in Appendix D.

• Thermal Pad #2 Drawing

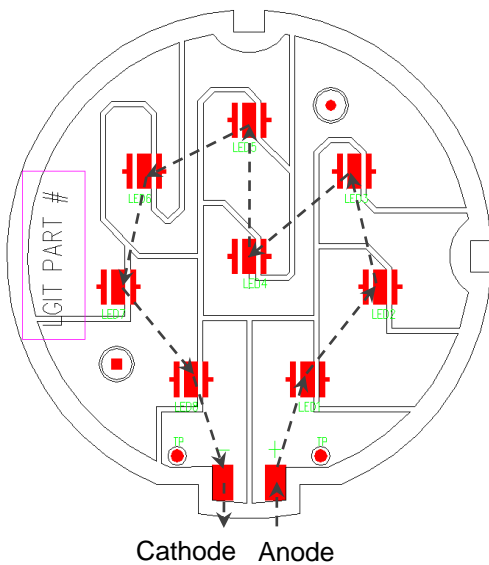


5. Product Components

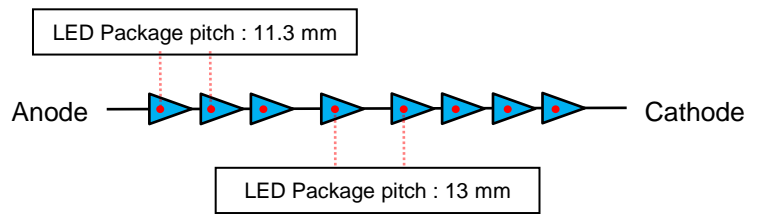


Module Assembly

6. PCB Circuit Diagram



PCB Solder (Top view)



Internal Circuit of PCB

7. Reliability Tests (tested internally)

7.1. Performance Test

No	Test	Design Standard		Test Condition	Sample Quantity
		Test Item	Success Criteria		
1	Optical Property Test (Initial values)	Luminous Flux [lm]	Refer to Each Lens Specification	- Ambient Temperature (25 °C) - Must use constant current LED Driver (Tolerance $\pm 3\%$) - Must be measured within 10 seconds after power is applied	All
		CCT [K]	5665 \pm 355		
		CRI	Min. 70		

7.2. Safety Test

No.	Test	Design Standard		Test Condition	Sample Quantity
		Condition	Success Criteria		
1	IP Class Test	Protection Against Solids and Liquids	IP67	IP67 (Waterproof Chamber) 500mm / 1 Hr	3
2	Vibration Test	Protection Against Vibration	Normal Condition	Shipping Box 1.5G/5~30Hz/10,000 cycles	1 Box
3	Impact Test	Protection Against Impact	Normal Condition	Shipping Box Dropping onto the Ground (1 m) / 10 cycles	1 Box

7.3. Appearance and Structure Check

No.	Test	Design Standard		Test Condition	Sample Quantity
		Test	Success Criteria		
1	Appearance And Structure Check	Structure	No Structural Problems	Refer to "Pre-shipment Inspection"	All
		Appearance	No Appearance Problems		

7. Reliability Tests (tested internally)

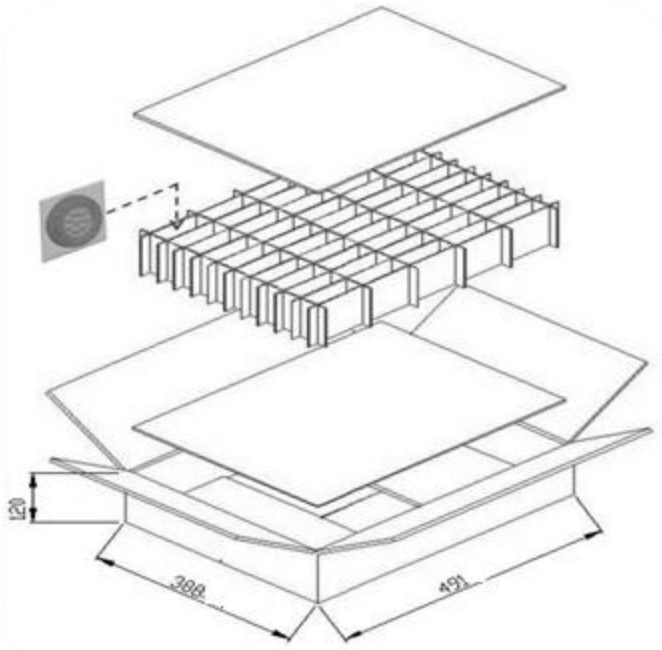
7.4. Reliability Test Conditions and Results

	List of Test	Test Condition	Design		Test Hours/ Cycles	Sample Quantity	Pass/ Fail
			Test	Success Criteria			
Operating Test	Room Temperature Operating Test	Ta=25 °C , 650mA	Luminous Flux [lm]	Min. 90% Against Initial Value	1,000 Hours	5 units	1/0
			Color Temperature [K]	Initial Value ± 5%			
		Ta=25 °C , 750mA	CRI	Min. 70	1,000 Hours	3 units	1/0
	High Temperature Operating Test	Ta=60 °C , 650mA	Luminous Flux [lm]	Min. 70% Against Initial Value	1,000 Hours	5 units	1/0
			Color Temperature [K]	Initial Value ± 10%			
		Ta=60 °C , 750mA	CRI	Min. 70	1,000 Hours	3 units	1/0
	Low Temperature Operating Test	Ta=-30 °C 650mA	Luminous Flux [lm]	Min. 90% Against Initial Value	1,000 Hours	5 units	1/0
			Color Temperature [K]	Initial Value ± 10%			
			CRI	Min. 70			
	High Temperature and Humidity Operating Test	Ta=85 °C , 85% RH 750mA	Luminous Flux [lm]	Min. 70% Against Initial Value	1,000 Hours	5 units	1/0
			Color Temperature [K]	Initial Value ± 10%			
			CRI	Min. 70			
High Temperature and Humidity Operating Test	Ta=60 °C , 90% RH 650mA	Luminous Flux [lm]	Min. 70% Against Initial Value	1,000 Hours	5 units	1/0	
		Color Temperature [K]	Initial Value ± 10%				
		CRI	Min. 70				
ON / OFF Test	ON(10sec) / OFF(10sec) 650mA	Luminous Flux [lm]	Min. 70% Against Initial Value	30,000 Cycles	5 units	1/0	
		Color Temperature [K]	Initial Value ± 10%				
		CRI	Min. 70				
Storage Test	High Temperature Storage Test	Ta=100 °C	Luminous Flux [lm]	Min. 70% Against Initial Value	1,000 Hours	5 units	1/0
			Color Temperature [K]	Initial Value ± 10%			
			CRI	Min. 70			
	Low Temperature Storage Test	Ta=-40 °C	Luminous Flux [lm]	Min. 90% Against Initial Value	1,000 Hours	5 units	1/0
			Color Temperature [K]	Initial Value ± 10%			
			CRI	Min. 70			
High Temperature and Humidity Storage Test	Ta=85 °C , 85% Rh	Luminous Flux [lm]	Min. 70% Against Initial Value	1,000 Hours	5 units	1/0	
		Color Temperature [K]	Initial Value ± 10%				
		CRI	Min. 70				
Environmental Test	Temperature Cycle Test	100 °C -40 °C (30min)	Luminous Flux [lm]	Min. 70% Against Initial Value	200 Cycles	5 units	1/0
			Color Temperature [K]	Initial Value ± 10%			
			CRI	Min. 70			
	Thermal Shock Test	100 °C:15min -40 °C:15min Transfer (5min)	Luminous Flux [lm]	Min. 70% Against Initial Value	300 Cycles	5 units	1/0
			Color Temperature [K]	Initial Value ± 10%			
			CRI	Min. 70			
	ESD Test	Contact : 8KV Air : 15KV		Normal Operation	3 Times	5 units	1/0
IP Test	IP 67	Refer to 7.2	Normal Operation	1 Hour	3 units	1/0	
Vibration Test	-	Refer to 7.2	Normal Operation	-	1 Box	1/0	
Drop Test	-	Refer to 7.2	Normal Operation	-	1 Box	1/0	

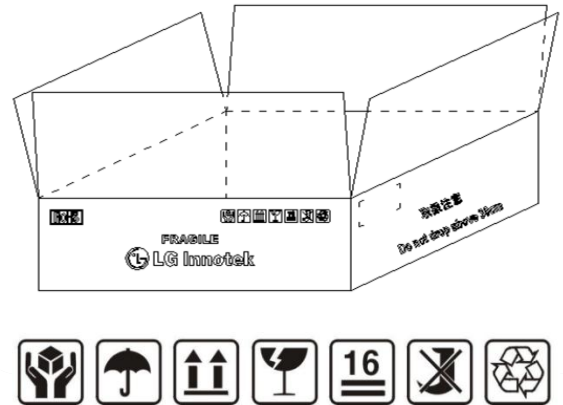
8. Cautions on Use

- The LED module should only be operated with constant current LED drivers that don't exceed the maximum ratings included in this document.
- A thermal management solution such as a heat sink, which will dissipate the heat generated by the LED module, should be tightly attached to the module to maintain the case temperature (T_c) below 70°C.
- The heat sink combined with the LED module should not be directly installed in a completely insulated ceiling or wall because that will not allow the heat generated by the LED module to be dissipated through convection.
- The lead wires of the LED module should not be pulled by any force because this may cause damage to the LED module.
- The LED module should not experience any physical impacts such as being dropped onto the ground.
- The IP class of the LED module is IP67, which means that the module can reliably be submerged in water at depths of between of 15cm and 1m for 30 minutes. The Ingress Protection class represents protection against solids and liquids only, and not for any harmful gases, which can damage the LEDs.
- Exceeding the maximum operating current of 750mA can overstress the LED module. This may result in significant acceleration of lumen depreciation or even permanent damage of the LED module.
- Do not touch any electrical traces or connection points with bare hands during operation.
- *LG Innotek* is not responsible for any damages caused if the operating or storage conditions exceed the absolute maximum ratings recommended in this document.

9. Packing and Shipping



Labels and Marks on the Box Surface



Shipping Box Drawings

Pallet Loading

Stacking : 3 (A) x 2 (B) x 8 (C)

Boxes per Pallet : 48 Boxes

A : 1164 mm

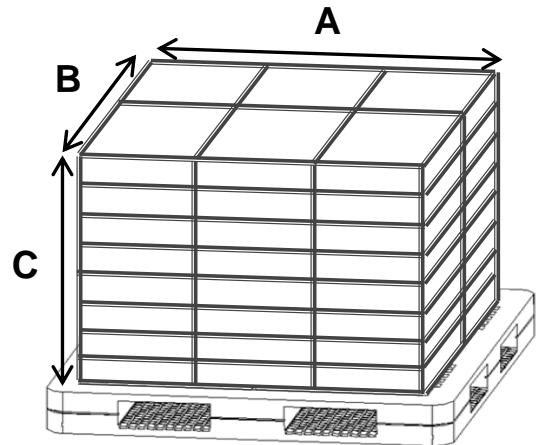
B : 982 mm

C : 960 mm

Pallet Dimensions

1300 mm (L) x 1100 mm (W) x 150 mm (H)

* Pallet Weight : 16 Kg



- Each module should be wrapped by aircap envelopes and sealed with a label.
- After wrapping, 50 LED modules are packed in one box.
- In the case of international shipping, available product lines, shipping rates, time and costs may vary depending on the destinations.
- The minimum order quantity for each model is 50 units, as wrapped in the box shown above.

Appendix A. Ordering Information

Item	Option	Code
CCT	3000K	15K <u>2</u> 0*A
	4000K	15K <u>4</u> 0*A
	5700K	15K <u>7</u> 0*A
	6500K	15K <u>9</u> 0*A
Lens	Type II (H:160° V:70°)	15K*0 <u>1</u> A
	Type III (H:135° V:60°)	15K*0 <u>2</u> A
	Type V (Square 130°)	15K*0 <u>3</u> A
	Type V (Circle 130°)	15K*0 <u>4</u> A
	Type V (Circle 115°)	15K*0 <u>5</u> A
	Type V (Circle 30°)	15K*0 <u>6</u> A
	Type V (Circle 20°)	15K*0 <u>7</u> A

Example : Type III Lens, 5700K Cool White

Product Name	CCT	Lens
LLDMWW0 -	15K <u>7</u> 0**	15K*0 <u>2</u> *



LLDMWW0-15K702A

Appendix B. Product Proliferation

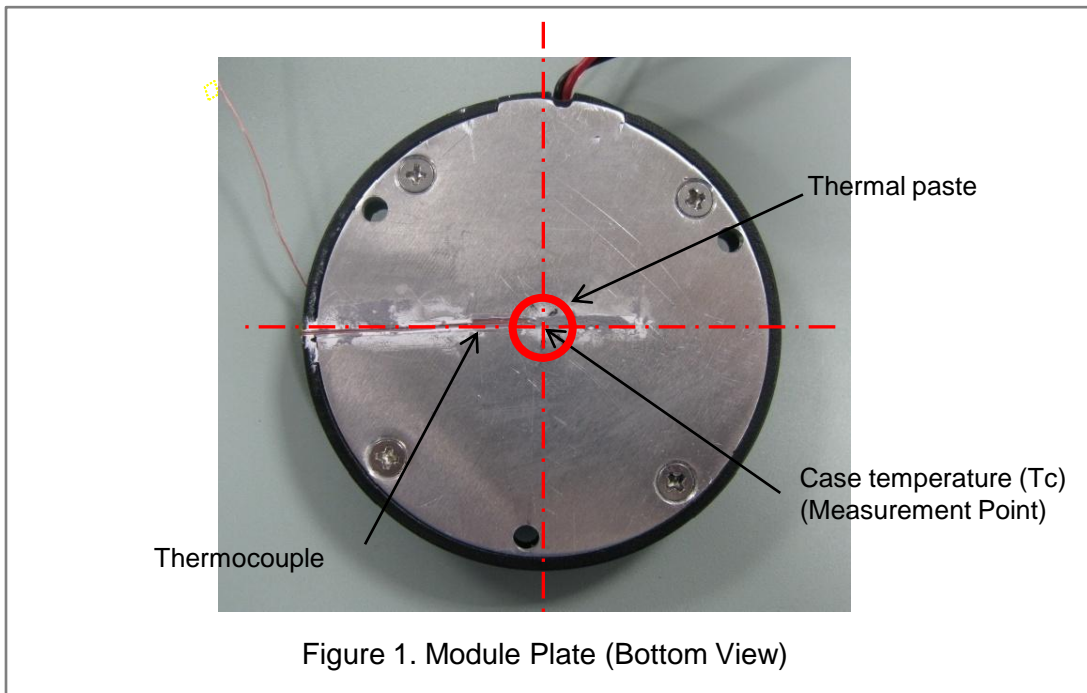
1. Model Name Proliferation

Model	Lens	Model Name	CCT	CRI
Cool White Outdoor LED Module	Type II (H:160° V:70°)	LLDMWW0-15K901A	6500K	Min. 70
	Type III (H:135° V:60°)	LLDMWW0-15K902A		
	Type V (Square 130°)	LLDMWW0-15K903A		
	Type V (Circle 130°)	LLDMWW0-15K904A		
	Type V (Circle 115°)	LLDMWW0-15K905A		
	Type V (Circle 30°)	LLDMWW0-15K906A		
	Type V (Circle 20°)	LLDMWW0-15K907A		
	Type II (H:160° V:70°)	LLDMWW0-15K701A	5700K	Min. 70
	Type III (H:135° V:60°)	LLDMWW0-15K702A		
	Type V (Square 130°)	LLDMWW0-15K703A		
	Type V (Circle 130°)	LLDMWW0-15K704A		
	Type V (Circle 115°)	LLDMWW0-15K705A		
	Type V (Circle 30°)	LLDMWW0-15K706A		
	Type V (Circle 20°)	LLDMWW0-15K707A		
Neutral White Outdoor LED Module	Type II (H:160° V:70°)	LLDMWW0-15K401A	4000K	Min. 80
	Type III (H:135° V:60°)	LLDMWW0-15K402A		
	Type V (Square 130°)	LLDMWW0-15K403A		
	Type V (Circle 130°)	LLDMWW0-15K404A		
	Type V (Circle 115°)	LLDMWW0-15K405A		
	Type V (Circle 30°)	LLDMWW0-15K406A		
	Type V (Circle 20°)	LLDMWW0-15K407A		
	Warm White Outdoor LED Module	Type II (H:160° V:70°)		
Type III (H:135° V:60°)		LLDMWW0-15K202A		
Type V (Square 130°)		LLDMWW0-15K203A		
Type V (Circle 130°)		LLDMWW0-15K204A		
Type V (Circle 115°)		LLDMWW0-15K205A		
Type V (Circle 30°)		LLDMWW0-15K206A		
Type V (Circle 20°)		LLDMWW0-15K207A		

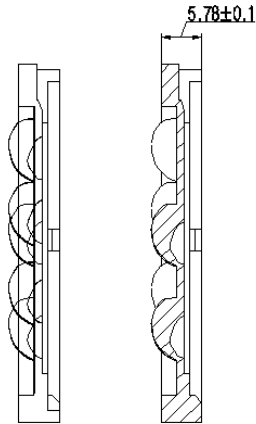
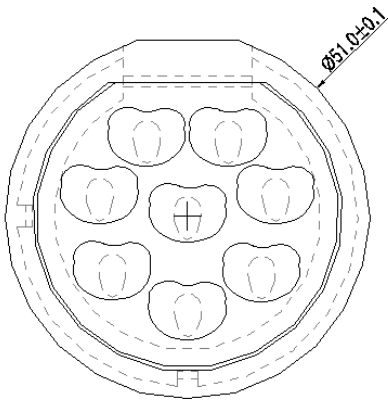
Appendix C. Case Temperature Point

- Case Temperature (T_c) is the temperature at the center point of the module plate illustrated in Figure 1, where T_c is measured with a thermocouple.

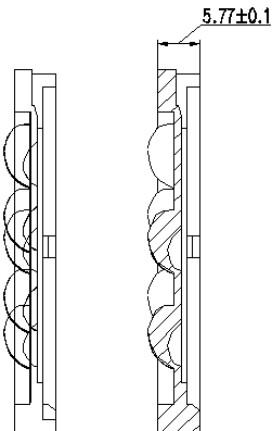
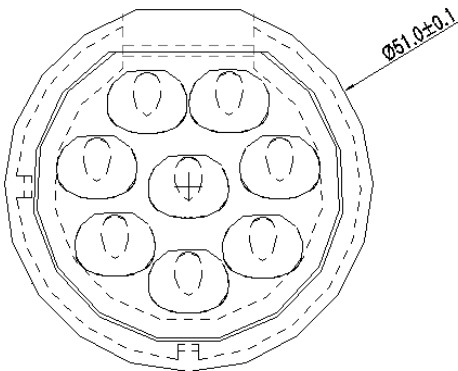
*The case temperature (T_c) should be lower than 70°C while the LED modules are operating.



Appendix D. Lens Drawings

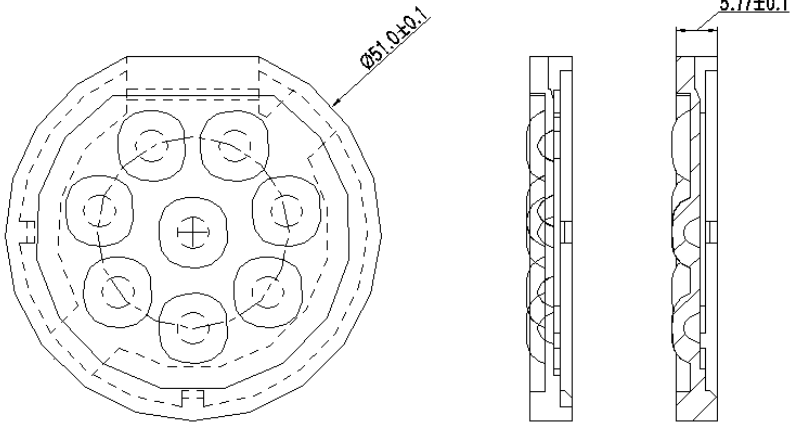


Type II (H:160° V:70°)

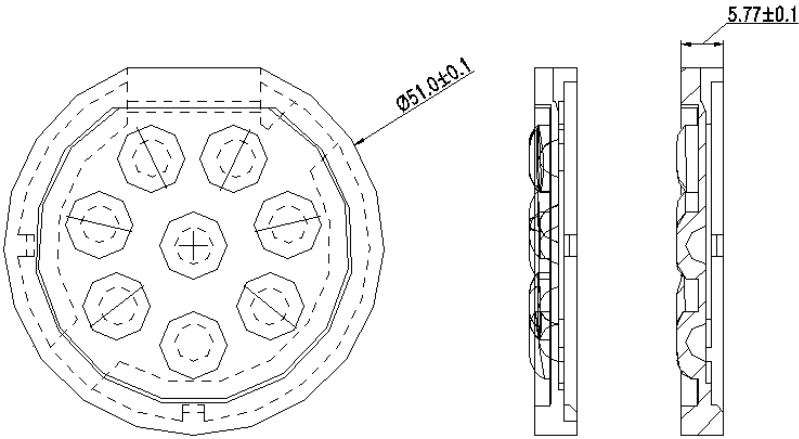


Type III (H:135° V:60°)

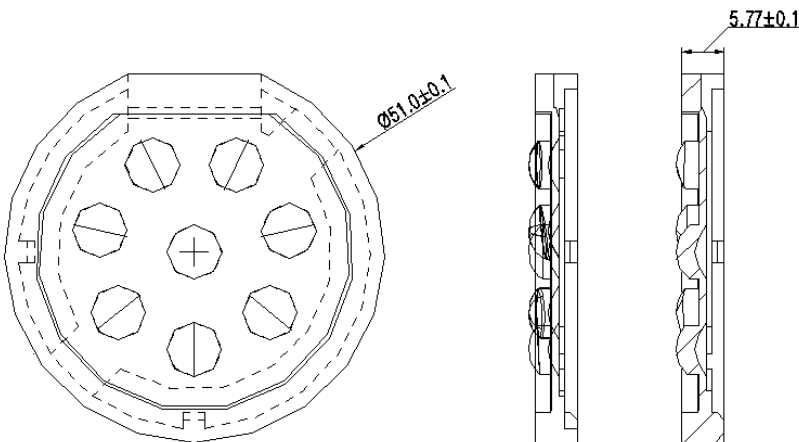
Appendix D. Lens Drawings



Type V (Square 130°)

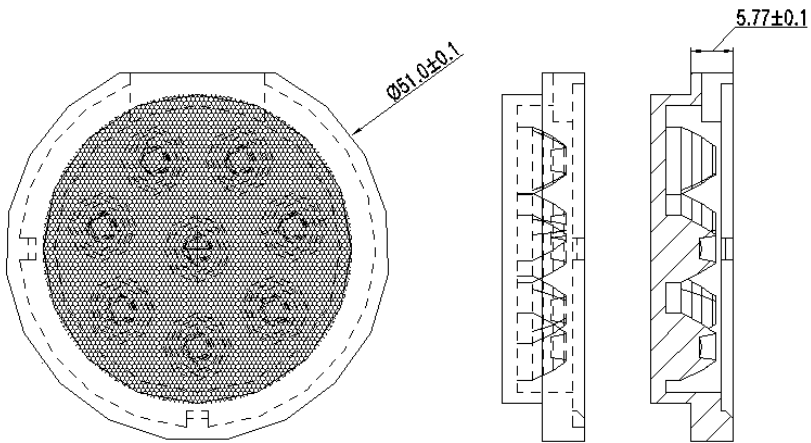


Type V (Circle 130°)

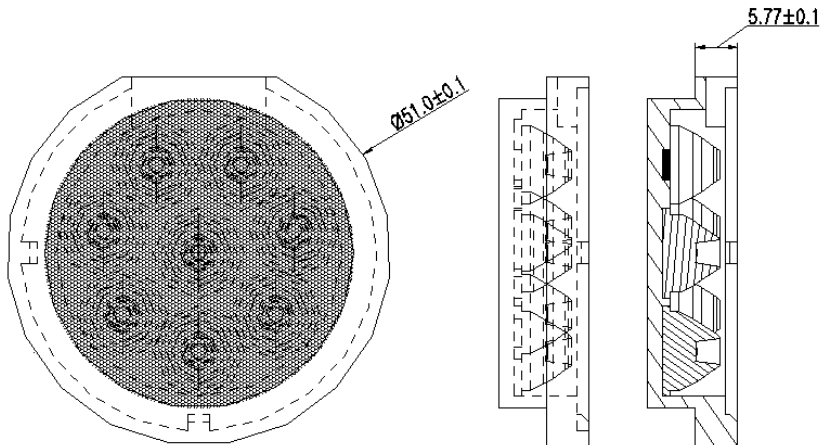


Type V (Circle 115°)

Appendix D. Lens Drawings



Type V (Circle 30°)



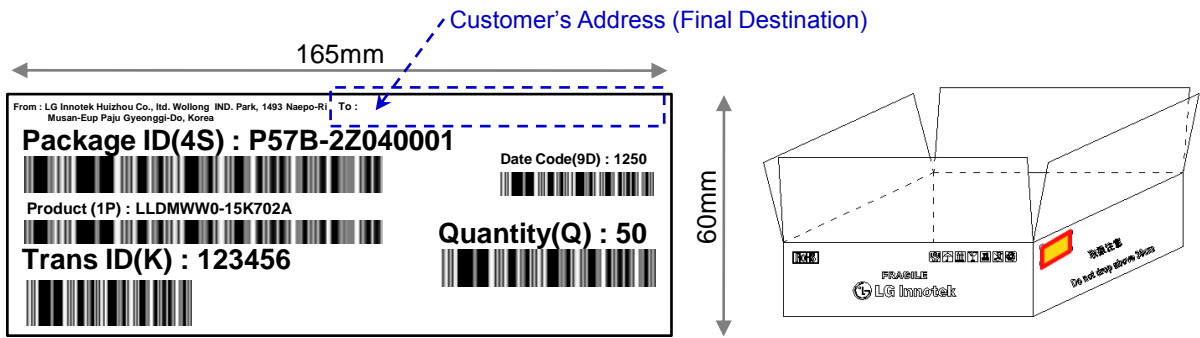
Type V (Circle 20°)

Appendix E. Labels

1. Box Label

Out-Box Label

Label Attached on a Box



A. Package ID(4S)

1	2	3	4	5																																																						
<table border="1"> <thead> <tr><th>Site</th><th>Code</th></tr> </thead> <tbody> <tr><td>Huizhou</td><td>H</td></tr> <tr><td>Paju</td><td>P</td></tr> <tr><td>Bolim</td><td>B</td></tr> </tbody> </table>	Site	Code	Huizhou	H	Paju	P	Bolim	B	<table border="1"> <thead> <tr><th>CCT</th><th>Code</th></tr> </thead> <tbody> <tr><td>3000K</td><td>30</td></tr> <tr><td>4000K</td><td>40</td></tr> <tr><td>5700K</td><td>57</td></tr> <tr><td>6500K</td><td>65</td></tr> </tbody> </table>	CCT	Code	3000K	30	4000K	40	5700K	57	6500K	65	<table border="1"> <thead> <tr><th>Code</th><th>Type</th></tr> </thead> <tbody> <tr><td>A</td><td>Type II (H:160°,V:70°)</td></tr> <tr><td>B</td><td>Type III (H:135°,V:60°)</td></tr> <tr><td>C</td><td>Type V (Sq 130°)</td></tr> <tr><td>D</td><td>Type V (130°)</td></tr> <tr><td>E</td><td>Type V (115°)</td></tr> <tr><td>F</td><td>Type V (30°)</td></tr> <tr><td>G</td><td>Type V (20°)</td></tr> </tbody> </table>	Code	Type	A	Type II (H:160°,V:70°)	B	Type III (H:135°,V:60°)	C	Type V (Sq 130°)	D	Type V (130°)	E	Type V (115°)	F	Type V (30°)	G	Type V (20°)	<table border="1"> <thead> <tr><th>Code</th></tr> </thead> <tbody> <tr><td>-</td></tr> </tbody> </table>	Code	-																			
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B. Product (1P) : Model Name

C. Trans ID(K) : P.O Number

D. Quantity(Q) : Number of products in a box

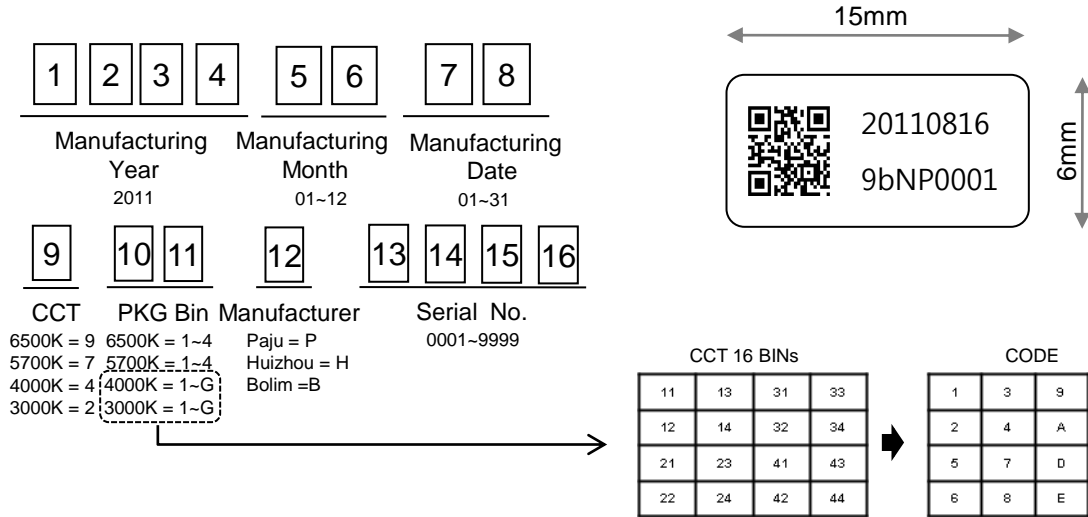
E. From / To : Final shipping site / Final destination for shipping

* Identification Marks(4S, 1P, K, Q) should be positioned at the first place in the bar code. (Code 128)

Appendix E. Labels

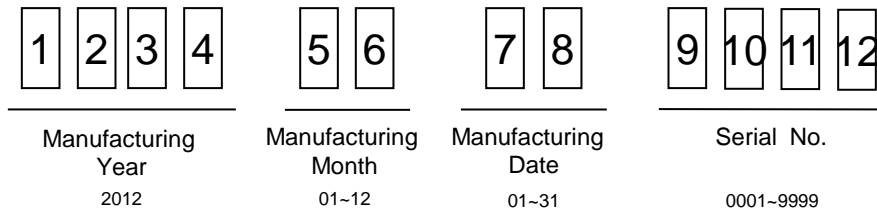
2. PCB Label

PCB Label Serial Number

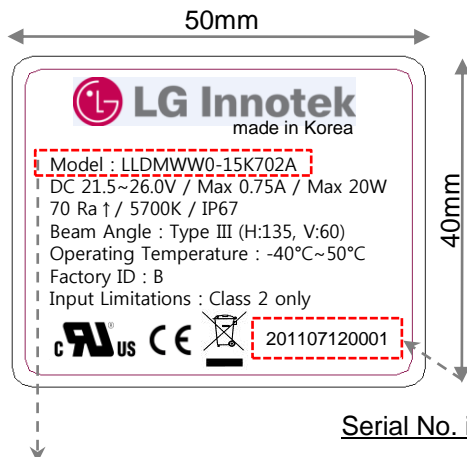


3. Aircap Label

Aircap Label Serial Number



Print Position for Serial Number



Aircap Label



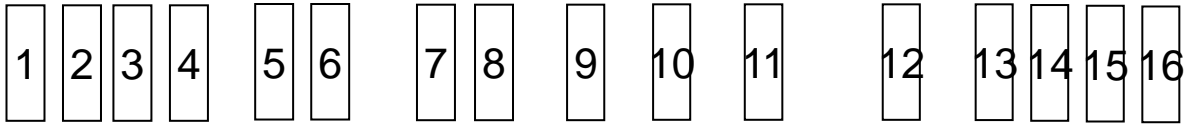
Serial No. is printed on the Aircap Sticker

* A product should be identical with the Model Name on the Aircap Label.

Appendix E. Labels

4. Bottom Plate Label

Bottom Plate Label Lot Number



Manufacturing Year (Last number) Manufacturing Month Manufacturing Date CCT Lens Type Connector C(O) N(X) Manufacturer P (Paju) H(Huizhou) B(Bolim) Serial No.

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Bottom Plate Label



Position for label attached on the bottom plate

