High Power LED

5W Edixeon™

Edixeon™ Emitter

Approved By Customer	Designer	Checker	Approval

Date：2006/07/31
Version：1.2
Device No. : 3-RD-01-E0017
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Edixeon emitters are one of the highest flux LEDs in the world by Edison Opto. Edixeon emitters are designed to satisfy more and more Solid-State lighting High Power LED applications for brilliant world such as flash light, indoor and outdoor decoration light. Edixeon emitters are designed by particular package for High Power LED. 5W Edixeon white has more than 160 lumens @700mA. Unlike most fluorescent sources, Edixeon contains no mercury and has more energy efficient than other incandescent light source.

Features

- Various colors
- More energy efficient than incandescent and most halogen lamps
- Low voltage operated
- Instant light
- Long operating life

Typical Applications

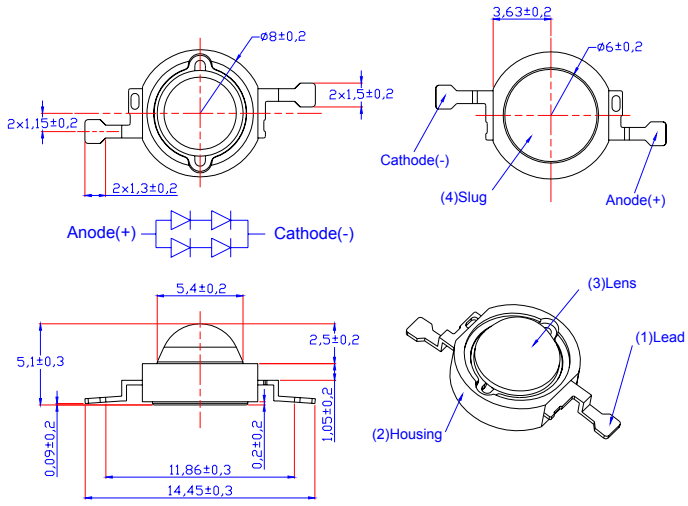
- Reading lights
- Portable flashlight
- Up-lighters and Down-lighters
- LCD Backlights
- General lighting
- Contour lights
- Ceiling lights
- Garden lighting
- Decoration lights
- Architectural lighting
- Beacon lights

Edixeon Technology

- Tjmax = 135 ^{O}C
- High Lumen performance
- Low thermal resistance 5 ^{O}C/W
- RoHS compliant
- Industrial best lumen maintenance — 50,000hrs life at I_{Fmax} with 70% lumen if Tj is lower than 70 ^{O}C

Package Outlines

Lambertian



Unit:mm

1. All dimensions are in mm.
2. It is strongly recommended that the temperature of lead be not higher than 55℃.
3. It is important that the slug can't contact aluminum surface, It is strongly recommended that there should coat an uniform electrically isolated heat dissipation film on the aluminum surface.

Absolute Maximum Ratings

Parameter	Symbol	Rating	Units
DC Forward Current	I_F	**700**	mA
Peak pulse current;(tp≦100μs, Duty cycle=0.25)	I_{pulse}	**1000**	mA
Reverse Voltage	V_R	**5**	V
Forward Contact Voltage	V_{FC}	**16**	V
LED junction Temperature	T_j	**135**	℃
Operating Temperature	T_{opr}	**-30 ~ +110**	℃
Storage Temperature	T_{stg}	**-40 ~ +120**	℃
Soldering Temperature	**JEDEC 020c**	**260**	℃
ESD Sensitivity	V_B	**500**	V
Manual Soldering Time at 260℃(Max.)	T_{sol}	**5**	*seconds*

Notes

1. Proper current derating must be observed to maintain junction temperature below the maximum.
2. LEDs are not designed to be driven in reserve bias.

Luminous Flux Characteristics at I_F=700mA(Tj=25℃):

Lens Item	Part Name	Color	Flux			Units
			Min.	Typ.	Max.	
Lambertian	**EDEW-5LA6**	White	***112.5***	***160.0***	**--**	*lm*
	EDEX-5LA6	Warm White	***86.5***	***110.0***	**--**	*lm*
	EDEB-5LA6	Blue	***30.3***	***50.0***	**--**	*lm*

Forward Voltage Characteristics at I_F=700mA(Tj=25℃):

Lens Item	Part Name	Color	V_F			Units
			Min.	Typ.	Max.	
Lambertian	**EDEW-5LA6**	White	***7.0***	**--**	***8.5***	*V*
	EDEX-5LA6	Warm White	***7.0***	**--**	***8.5***	*V*
	EDEB-5LA6	Blue	***7.0***	**--**	***8.5***	*V*

Wavelength or Color Temperature Characteristics at I_F=700mA(Tj=25℃):

Lens Item	Part Name	Color	λd/CCT			Units
			Min.	Typ.	Max.	
Lambertian	**EDEW-5LA6**	White	***5000***	**--**	***8000***	*K*
	EDEX-5LA6	Warm White	***2800***	**--**	***3800***	*K*
	EDEB-5LA6	Blue	***460***	**--**	***475***	*nm*

Temperature Coefficient of Forward Voltage & Thermal Resistance Junction to Case Characteristics at I_F=700mA(Tj=25℃) :

Lens Item	Part Name	Color	$\triangle V_F/\triangle T$		$R\theta_{J-B}$	
			Typ.	Units	Typ.	Units
Lambertian	**EDEW-5LA6**	White	***-2***	*mV/℃*	***5***	*℃/W*
	EDEX-5LA6	Warm White	***-2***	*mV/℃*	***5***	*℃/W*
	EDEB-5LA6	Blue	***-2***	*mV/℃*	***5***	*℃/W*

Emission Angle Characteristics at I_F=700mA(Tj=25℃):

Part Name	Color	2Θ½			Units
		Min.	Typ.	Max.	
EDEW-5LA6	White		***130***		Degrees
EDEX-5LA6	Warm White		***130***		Degrees
EDEB-5LA6	Blue		***150***		Degrees

Note

1. **Flux is measured with an accuracy of ± 10%.**
2. **CCT selection acc. to CCT groups and an accuracy of ± 200K**
3. **Forward Voltage is measured with an accuracy of ± 0.1V**
4. **Wavelength is measured with an accuracy of ± 0.5nm**
5. **All white、warm white and blue emitters are built with InGaN**

JEDEC Moisture Sensitivity:

Level	Floor Life		Soak Requirements			
			Standard		Accelerated Environment	
	Time	Conditions	Time (hours)	Conditions	Time (hours)	Conditions
4	**72hours**	**≦30℃ / 60% RH**	**96 +2/-0**	**30℃ / 60% RH**	**20 +0.5/-0**	**60℃ / 60% RH**

LEVEL	FLOOR LIFE		SOAK REQUIREMENTS			
			STANDARD		ACCELERATED EQUIVALENT [1]	
	TIME	CONDITIONS	TIME (hours)	CONDITIONS	TIME (hours)	CONDITIONS
1	Unlimited	≤30°C/85% RH	168 +5/-0	85°C/85% RH		
2	1 year	≤30°C/60% RH	168 +5/-0	85°C/60% RH		
2a	4 weeks	≤30°C/60% RH	696[2] +5/-0	30°C/60% RH	120 +1/-0	60°C/60% RH
3	168 hours	≤30°C/60% RH	192[2] +5/-0	30°C/60% RH	40 +1/-0	60°C/60% RH
4	72 hours	≤30°C/60% RH	96[2] +2/-0	30°C/60% RH	20 +0.5/-0	60°C/60% RH
5	48 hours	≤30°C/60% RH	72[2] +2/-0	30°C/60% RH	15 +0.5/-0	60°C/60% RH
5a	24 hours	≤30°C/60% RH	48[2] +2/-0	30°C/60% RH	10 +0.5/-0	60°C/60% RH
6	Time on Label (TOL)	≤30°C/60% RH	TOL	30°C/60% RH		

Note

1. **The standard soak time includes a default value of 24 hours for semiconductor manufacturer's exposure time (MET) between bake and bag and includes the maximum time allowed out of the bag at the distributor's facility.**

Operating life, mechanical, and environmental tests performed on Edixeon package:

Stress Test	Stress Conditions	Stress Duration	Failure Criteria
Room Temperature Operating Life	25℃, I_F = max DC (Note 1)	1000 hours	Note 2
High Temperature High Humidity Operating Life	85℃ / 85%RH, I_F = max DC	1000 hours	Note 2
Temperature Cycle	-40℃/100℃ ,30 min dwell /＜5min transfer	200 cycles	Note 2
High Temperature Storage Life	110℃	1000 hours	Note 2
Low Temperature Storage Life	-55℃	1000 hours	Note 2
Thermal Shock	-40 / 120℃, 20 min dwell /＜20 sec transfer	200 cycles	No catastrophics
Mechanical Shock	1500 G, 0.5 msec pulse, 5 shocks each 6 axis		No catastrophics
Natural Drop	On concrete from 1.2 m, 3X		No catastrophics
Variable Vibration Frequency	10-2000-10 Hz, log or linear sweep rate, 20 G about 1 min, 1.5 mm, 3X/axis		No catastrophics
Solder Heat Resistance (SHR)	260℃ ± 5℃, 10 sec		No catastrophics
Solderability	Steam age for 16 hr, then solder dip at 260℃ for 5 sec		Solder coverage on lead

Note

1. **Depending on the maximum derating curve.**
2. **Failure Criteria:**

Electrical failures

V_F shift >=10%

I_R<50uA @Vr=5V

Light Output Degradation

% Iv shift >= 35% @1000hrs or 200cycle

Visual failures

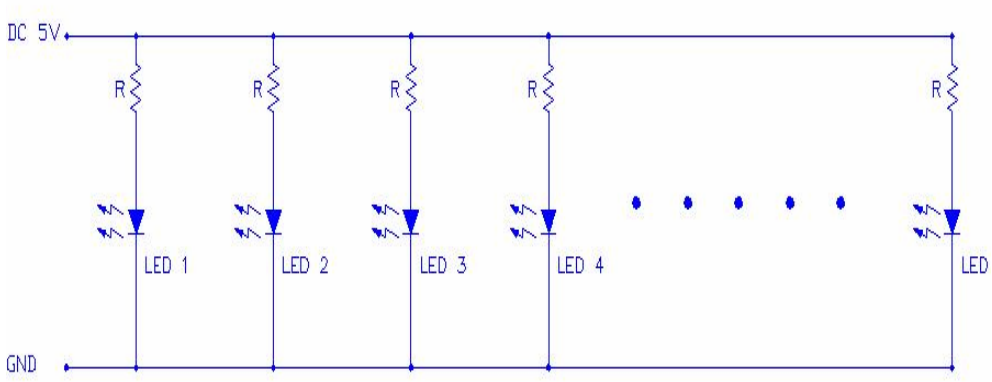
Broken or damaged package or lead

Solder-ability < 95% wetting

Dimension out of tolerance

degradation at 1000 hours, or an average Iv degradation for the test of greater than 35% at 1000 hours.

Burn-in Condition Edixeon Reliability



When we talk about MTBF of Edixeon, we can provide a formula for customers.

$$\log(\text{Life}) = \frac{1600}{Tj(^{\circ}C)+273}$$

Life means the time light output becomes 70%

Tj (°C)	Life (hours)	Tj (°C)	Life (hours)
25	*234,000*	*85*	*29,500*
30	*191,000*	*90*	*25,700*
35	*157,000*	*95*	*22,300*
40	*129,000*	*100*	*19,500*
45	*107,000*	*105*	*17,100*
50	*90,000*	*110*	*15,100*
55	*75,000*	*115*	*13,300*
60	*64,000*	*120*	*11,700*
65	*54,000*	*125*	*10,500*
70	*46,000*	*130*	*9,300*
75	*39,600*	*140*	*7,500*
80	*34,000*	*150*	*6,000*

When we talk about MTTF of Edixeon, we can provide a formula for customers

MTTF is assumed to be 100,000,000

The failure rates at different hours and different systems(LED quantity) are as below:

if there is 1 failure of 1 emitter in a system

Tj=75℃ is giving 0.01%(100ppm) at 10,000hrs

if there is 1 failure of 10 emitters in a system

Tj=75℃ is giving 0.1%(1,000ppm) at 10,000hrs

if there is 1 failure of 1 emitter in a system

Tj=75℃ is giving 0.05%(500ppm) at 50,000hrs

if there is 1 failure of 10 emitters in a system

Tj=75℃ is giving 0.5%(5,000ppm) at 50,000hrs if there are 10 emitters

How to Know Tj in Your Application?

Rth(junction to case)=5°C/W

The thermal grease is 200um.

K(Aluminum PCB)=2.6 W/mk

Then Rth(case to board)= $\frac{200}{2.6\text{x}(6.4/2)^2\pi}$ **=2.4 °C/W**

The Rth between board and air is mainly dependent on the total surface air.

Rth(board-air)≒ $\frac{500}{\text{Area}(cm^2)}$

If Area is 30cm² Rth=16.7 ΔT(junction-air)=(5+2.4+16.7)x5=120.1 °C

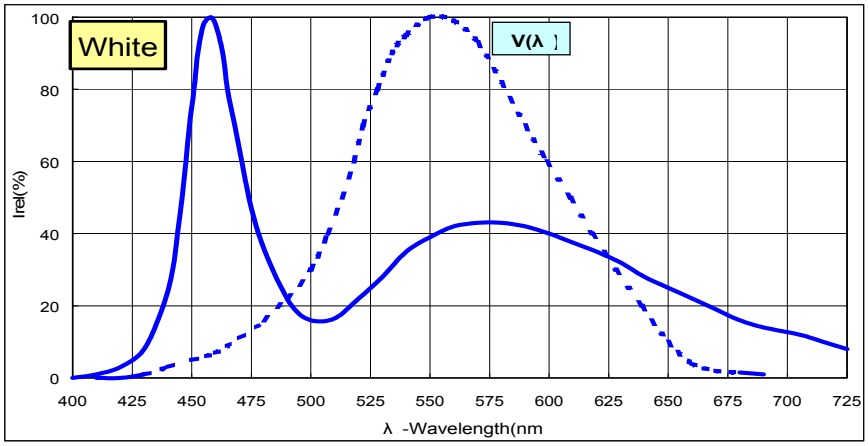
If Area is 90cm² Rth=5.5 ΔT (junction-air)=(5+2.4+5.5)x5=64.5 °C

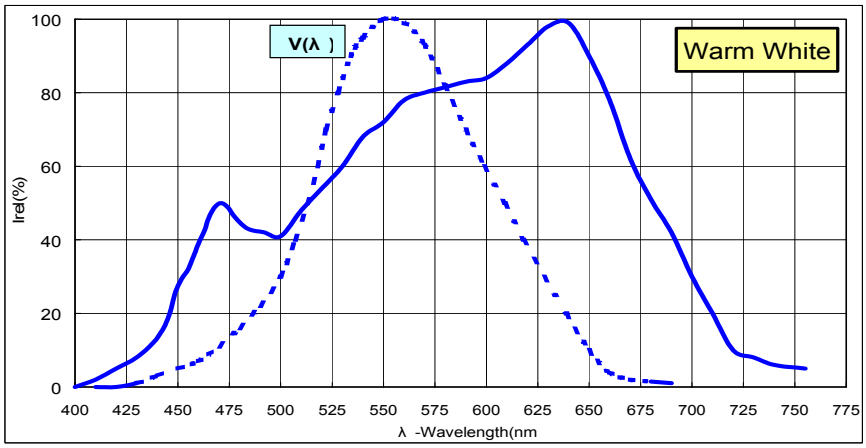
If Area is 150cm² Rth=3.3 ΔT (junction-air)=(5+2.4+3.3)x5=53.5 °C

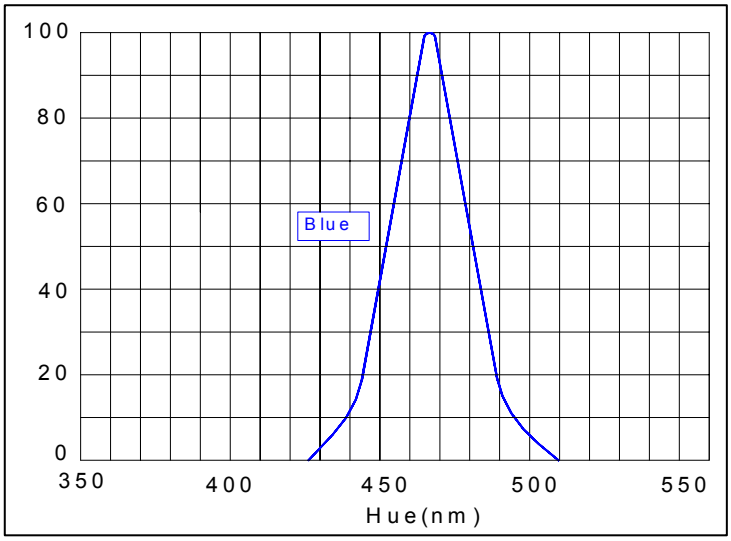
ASSIST FORM about High Power LED Reliability(White Edixeon)

	Ts=45°C	Ts=65°C	Ts=85°C
Voltage	7.5V	7.5V	7.5V
Current	700mA	700mA	700mA
Wattage	5.25W	5.25W	5.25W
Heat	4.5W	4.5W	4.5W
Rth	5 °C/W	5 °C/W	5 °C/W
Tj	67.5 °C	87.5 °C	107.5 °C
$L_{70\%}$	50,000hrs	27,000hrs	16,000hrs

Electrical & Optical Curves-Spectrum

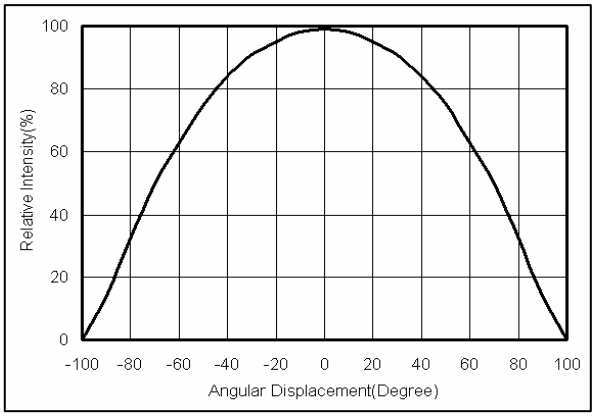




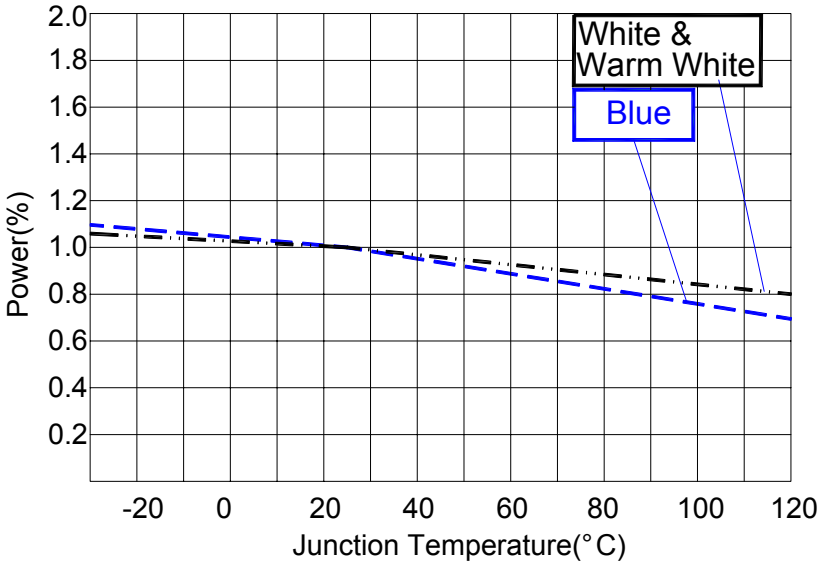


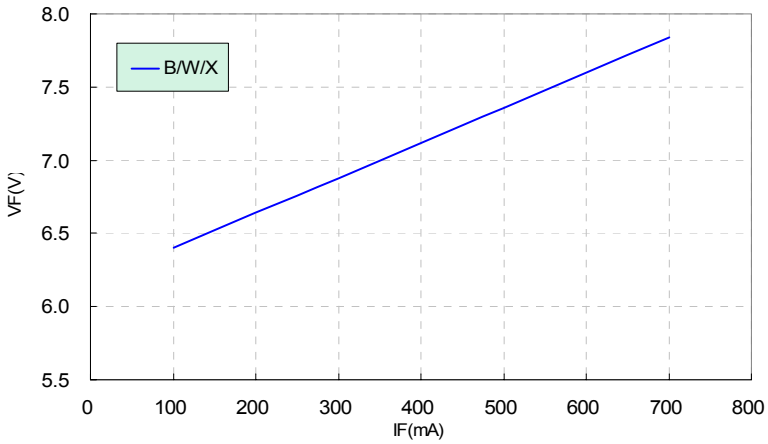
Typical Radiation Pattern for

Lambertian(for White, Warm white, Blue)



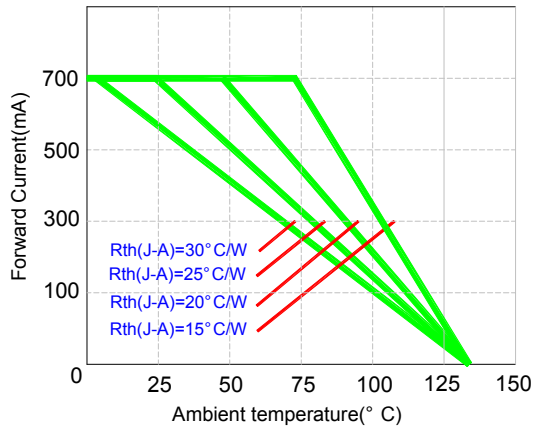
Typical Optical and Electrical Curves



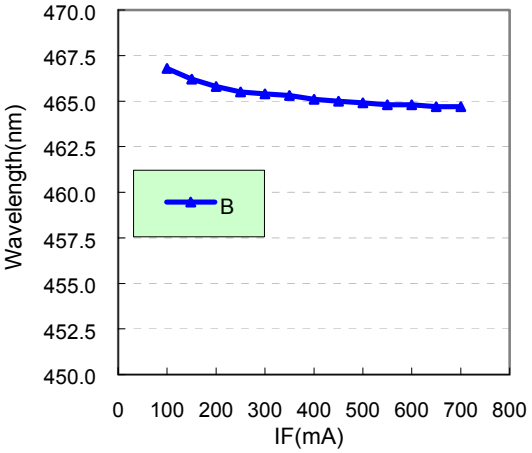


Operating Current & Forward Voltage

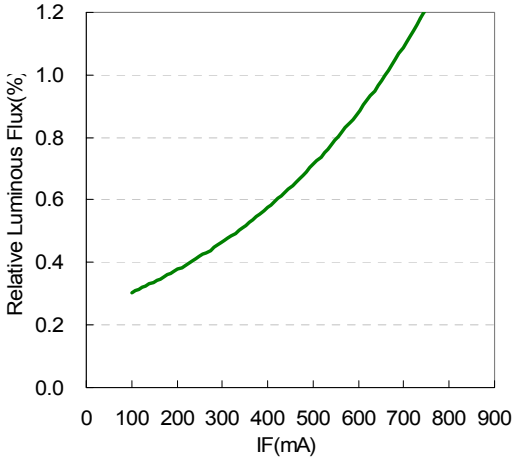
Typical Optical and Electrical Curves



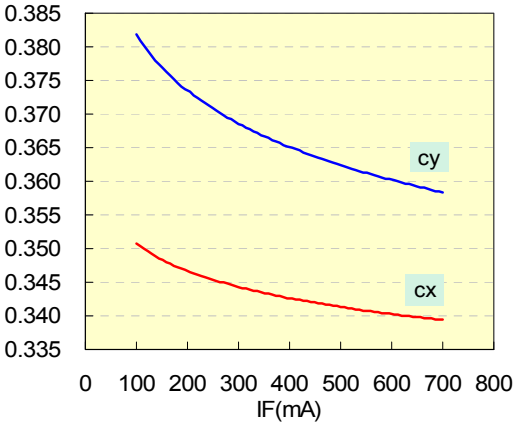
Operating Current & Ambient Temperature



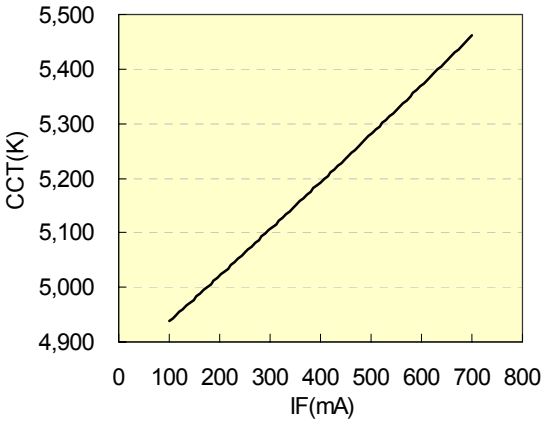
Forward Current & Wavelength



Forward Current & Luminous Flux

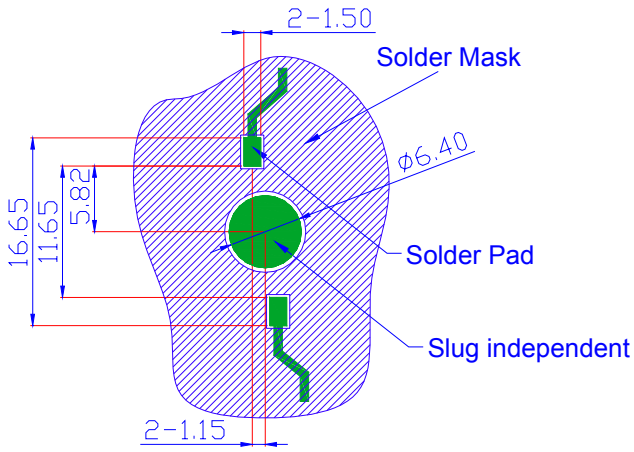


Forward Current & chromaticity coordinate



Forward Current &CCT

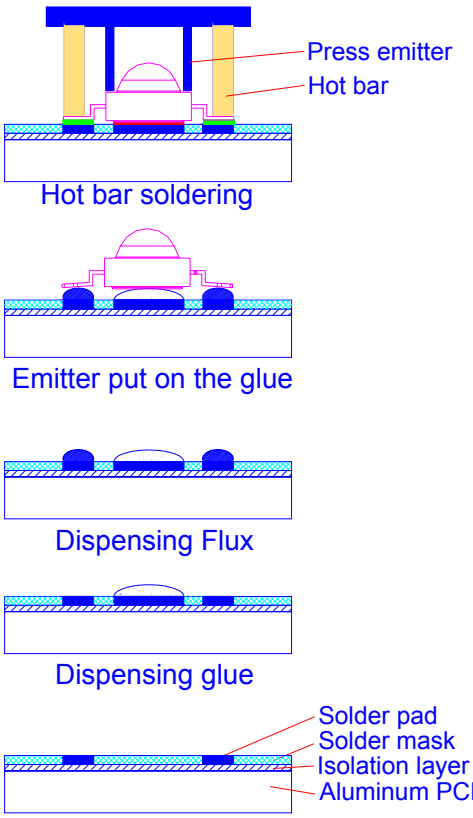
Recommend Solder Pad Design



Note:

Solder pad can't be connected to slug.

Recommend Solder Steps



Notes

1. **Aluminum PCB material with a thermal conductivity greater than 5.0 W/mK.**
2. **Solder pad can't be connected to slug.**
3. **The Thermal glue should be as thin as possible for better heat conductivity.**
4. **During any assembly process touching lens is avoided. This will cause pollution or scratch on the surface of lens.**
5. **Thermal glue with a thermal conductivity greater than 3.0 W/mK and the thickness must be less than 100μm.**

Adhesive for Emitter to Aluminum PCB

Suggestion:

- Ease of use

  Non-solvent, One-part
- Fast tack free

  3 minutes at 25°C
- No corrosion

  Alcohol type of RTV
- Low volatility

  Low weight loss of silicone volatiles
- Adhesion

  Excellent adhesion to most materials without use of a primer
- Dielectric properties

  Cured rubber exhibits good dielectric properties
- Excellent thermal stability and cold resistance

  Cured rubber provides wide service temperature range

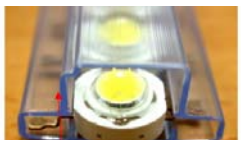
Typical Properties

Specification	Suggested Properties
Take-free time	3~10 minutes
Specific gravity	< 3 g/cm^2
Thermal conductivity	> 2.5 W/mK
Rth in using	< 1.8 °C/W
Volume resistance	> 1x10^{14}
Lap shear adhesion strength	> 200 N/ cm^2
Tensile strength	> 4 Mpa

Thrust for Edixeon Lens

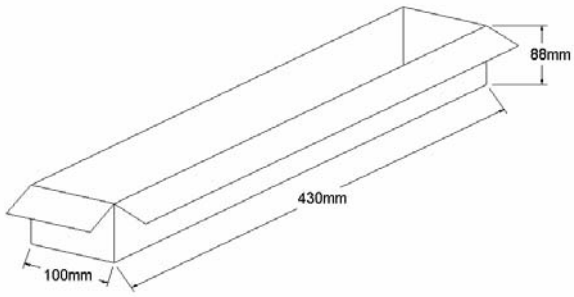
Lens Type	Typical Thrust
Lambertian Lens	5 kgf

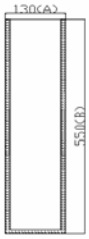
Package Specifications



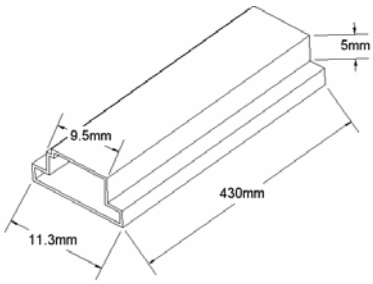
Cathode

Anode





Antistatic bag



Tube

Humidity indicator card

Drying agent

Notes

1. **There are 50pcs emitters in a tube**
2. **There are 20 tubes in a bag**
3. **There are 2 bags in an inner box**
4. **A bag contains one humidity indicator card and drying agent**

Packing Step	Type	Dimension(mm)	Emitter Q'ty(Max.)
1	Tube	430*13	50
2	Inner Box	430*100*88	1,000
3	Outer Box	460*196*135	2,000