



High Power LED

1W RC Edixeon™

RC Edixeon™ Emitter

Approved By Customer	Designer	Checker	Approval

Date : 2006/07/31
Version : 1.1
Device No. : 3-RD-01-E0029
EDISON OPTO CORPORATION
4F, No. 800, Chung-Cheng Rd,
Chung-Ho, Taipei 235, Taiwan
Tel: 886-2-8227-6996
Fax: 886-2-8227-6997
<http://www.edison-opto.com.tw>



1W RC EdixeonTM



RC Edixeon emitters are one of the highest flux LEDs in the world by Edison Opto. RC 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. RC Edixeon emitters are designed by particular package for reflow process application. 1W RC Edixeon white has typical 55 lumens @350mA. 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
- Reflow process compatible.

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

RC Edixeon Technology

- $T_{jmax} = 150^{\circ}\text{C}$
- High Lumen performance
- Low thermal resistance 12°C/W
- Industrial best moisture sensitivity level — JEDEC 2a
- Lead free reflow solder JEDEC 020C compatible
- RoHS compliant
- Industrial best lumen maintenance — 50,000hrs life at I_{Fmax} with 70% lumen if T_j is lower than 70°C



Absolute Maximum Ratings

Parameter	Symbol	Rating	Units
DC Forward Current	I_F	350	mA
Peak pulse current;(tp ≤ 100μs, Duty cycle=0.25)	I_{pulse}	500	mA
Reverse Voltage	V_R	5	V
Forward Contact Voltage	V_{FC}	16	V
LED junction Temperature	T_j	150	°C
Operating Temperature	T_{opr}	-30 ~ +110	°C
Storage Temperature	T_{stg}	-40 ~ +120	°C
Soldering Temperature	JEDEC 020c	260	°C
ESD Sensitivity	V_B	4000	V
Manual Soldering Time at 260°C (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.
3. Allowable reflow cycles are 3 times for each LED.

Luminous Flux & Radiometric Power^[1] Characteristics at $I_F=350\text{mA}(T_j=25^\circ\text{C})$:

Lens Item	Part Name	Color	Flux			Units
			Min.	Typ.	Max.	
Lambertian	EDEW-1LC1	White	30.3	55.0	--	lm
	EDEX-1LC1	Warm White	17.9	35.0	--	lm
	EDER-1LC3	Red	23.3	40.0	--	lm
	EDEO-1LC3	Red Orange	23.3	45.0	--	lm
	EDEA-1LC3	Amber	23.3	40.0	--	lm
	EDET-1LC1	True Green	30.3	55.0	--	lm
	EDEB-1LC1	Blue	8.2	20.0	--	lm
	EDEC-1LC1	Royal Blue ^[1]	--	200.0	--	mW

Forward Voltage Characteristics at $I_F=350\text{mA}(T_j=25^\circ\text{C})$:

Lens Item	Part Name	Color	V_F			Units
			Min.	Typ.	Max.	
Lambertian	EDEW-1LC1	White	3.1	--	4.3	V
	EDEX-1LC1	Warm White	3.1	--	4.3	V
	EDER-1LC3	Red	2.0	--	3.0	V
	EDEO-1LC3	Red Orange	2.0	--	3.0	V
	EDEA-1LC3	Amber	2.0	--	3.0	V
	EDET-1LC1	True Green	2.8	--	4.0	V
	EDEB-1LC1	Blue	3.1	--	4.3	V
	EDEC-1LC1	Royal Blue	3.1	--	4.3	V

Dominant Wavelength or Peak wavelength^[1] or Color Temperature Characteristics at $I_F=350\text{mA}(T_j=25^\circ\text{C})$:

Lens Item	Part Name	Color	λ_d/CCT			Units
			Min.	Typ.	Max.	
Lambertian	EDEW-1LC1	White	5000	--	8000	K
	EDEX-1LC1	Warm White	2800	--	3800	K
	EDER-1LC3	Red	620	--	630	nm
	EDEO-1LC3	Red Orange	610	--	620	nm
	EDEA-1LC3	Amber	585	--	595	nm
	EDET-1LC1	True Green	515	--	535	nm
	EDEB-1LC1	Blue	460	--	475	nm
	EDEC-1LC1	Royal Blue ^[1]	450	--	470	nm

Temperature Coefficient of Forward Voltage & Thermal Resistance Junction to Case Characteristics at $I_F=350\text{mA}(T_j=25^\circ\text{C})$:

Lens Item	Part Name	Color	$\Delta V_F/\Delta T$		$R\theta_{J-B}$	
			Typ.	Units	Typ.	Units
Lambertian	EDEW-1LC1	White	-2	mV/°C	12	°CW
	EDEX-1LC1	Warm White	-2	mV/°C	12	°CW
	EDER-1LC3	Red	-2	mV/°C	12	°CW
	EDEO-1LC3	Red Orange	-2	mV/°C	12	°CW
	EDEA-1LC3	Amber	-2	mV/°C	12	°CW
	EDET-1LC1	True Green	-2	mV/°C	12	°CW
	EDEB-1LC1	Blue	-2	mV/°C	12	°CW
	EDEC-1LC1	Royal Blue	-2	mV/°C	12	°CW

Emission Angle Characteristics at $I_F=350\text{mA}(T_j=25^\circ\text{C})$:

Part Name	Color	$2\theta_{1/2}$ (Typ.) Lambertian	Units
EDEW-1LC1	White	130	Degrees
EDEX-1LC1	Warm White	130	Degrees
EDER-1LC3	Red	120	Degrees
EDEO-1LC3	Red Orange	120	Degrees
EDEA-1LC3	Amber	120	Degrees
EDET-1LC1	True Green	150	Degrees
EDEB-1LC1	Blue	150	Degrees
EDEC-1LC1	Royal Blue	150	Degrees

Note

1. Flux is measured with an accuracy of $\pm 10\%$.
2. CCT selection acc. to CCT groups and an accuracy of $\pm 200\text{K}$
3. Forward Voltage is measured with an accuracy of $\pm 0.1\text{V}$
4. Wavelength is measured with an accuracy of $\pm 0.5\text{nm}$
5. All white, warm white, True green and blue emitters are built with InGaN
6. All red, red-orange and amber emitters are built with AlGaInP

JEDEC Moisture Sensitivity:

Level	Floor Life		Soak Requirements			
	Time	Conditions	Standard Time (hours)	Conditions	Accelerated Environment Time (hours)	Conditions
2a	4 weeks	≤30°C / 60% RH	696 +5/-0	30°C / 60% RH	120 +1/-0	60°C / 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/80% RH	168 +5/-0	85°C/80% RH		
2a	4 weeks	≤30°C/80% RH	696 ² +5/-0	30°C/80% RH	120 +1/-0	60°C/80% RH
3	168 hours	≤30°C/80% RH	192 ² +5/-0	30°C/80% RH	40 +1/-0	60°C/80% RH
4	72 hours	≤30°C/80% RH	96 ² +2/-0	30°C/80% RH	20 +0.5/-0	60°C/80% RH
5	48 hours	≤30°C/80% RH	72 ² +2/-0	30°C/80% RH	15 +0.5/-0	60°C/80% RH
5a	24 hours	≤30°C/80% RH	48 ² +2/-0	30°C/80% RH	10 +0.5/-0	60°C/80% RH
6	Time on Label (TOL)	≤30°C/80% RH	TOL	30°C/80% 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°C, I _F = max DC (Note 1)	1000 hours	Note 2
High Temperature High Humidity Operating Life	85°C / 85%RH, I _F = max DC	1000 hours	Note 2
Temperature Cycle	-40°C/100°C ,30 min dwell / <5min transfer	200 cycles	Note 2
High Temperature Storage Life	110°C	1000 hours	Note 2
Low Temperature Storage Life	-55°C	1000 hours	Note 2
Thermal Shock	-40 / 120°C, 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°C ± 5°C, 10 sec		No catastrophics
Solderability	Steam age for 16 hr, then solder dip at 260°C 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

% I_v shift >= 30% @1000hrs or 200cycle

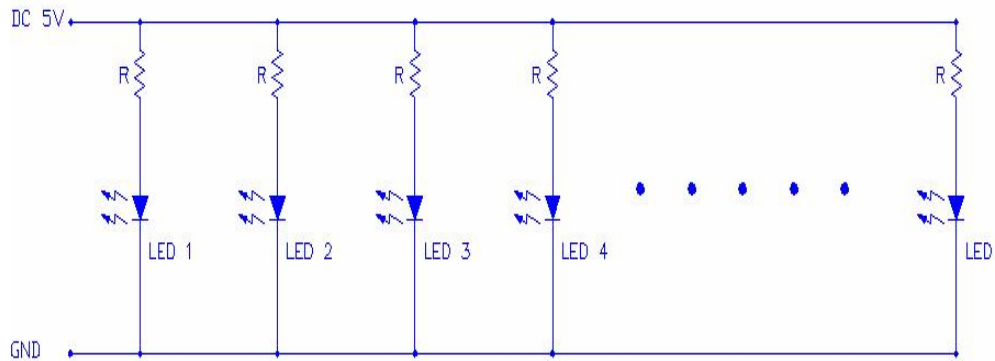
Visual failures

Broken or damaged package or lead

Solderability < 95% wetting

Dimension out of tolerance

Burn-in Condition RC Edixeon Reliability



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

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

Life means the time light output becomes 70%

T _j (°C)	Life (hours)	T _j (°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°C is giving 0.01%(100ppm) at 10,000hrs

if there is 1 failure of 10 emitters in a system

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

if there is 1 failure of 1 emitter in a system

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

if there is 1 failure of 10 emitters in a system

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

How to Know Tj in Your Application?

If it is white Edixeon, Rth(junction to case)=12°C/W

The thermal grease is 200um.

K(Aluminum PCB)=2.6 W/mk

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

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

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

If Area is 30cm² Rth=16.7 T(junction-air)=(12+2.4+16.7)x1=31.1 °C

If Area is 60cm² Rth=8.3 T(junction-air)=(12+2.4+8.3)x1=22.7 °C

If Area is 90cm² Rth=5.5 T(junction-air)=(12+2.4+5.5)x1=19.9 °C

ASSIST FORM about High Power LED Reliability(White Edixeon)

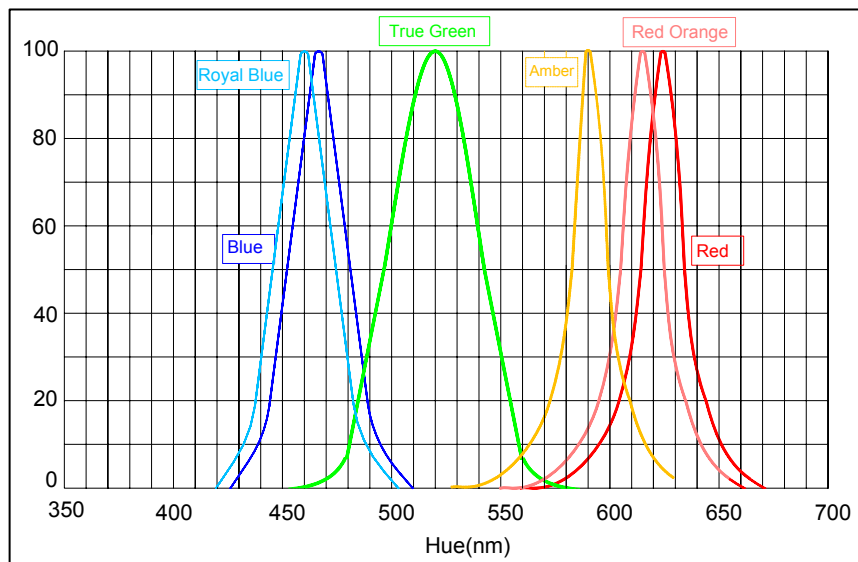
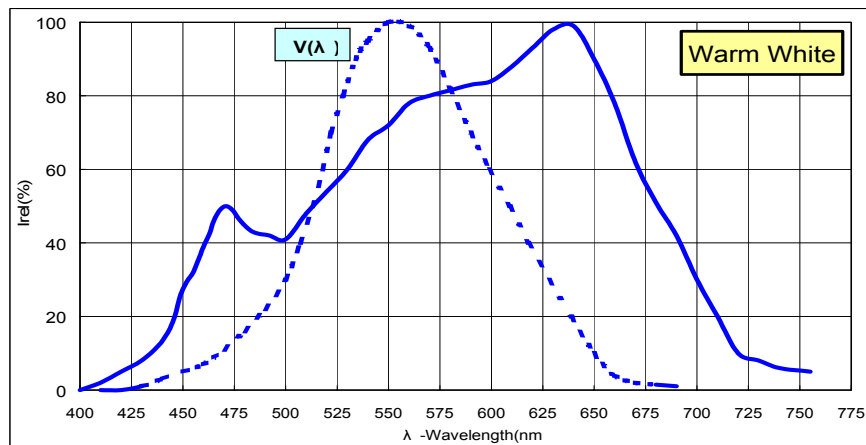
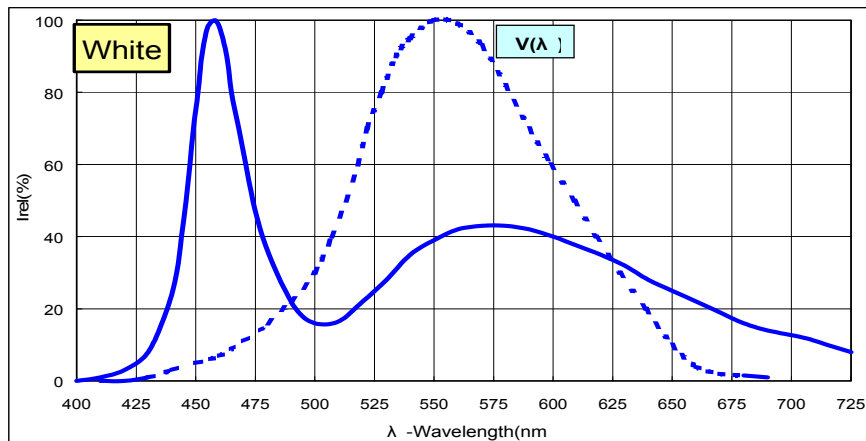
	Ts=45°C	Ts=65°C	Ts=85°C
Voltage	3.5V	3.5V	3.5V
Current	350mA	350mA	350mA
Wattage	1.2W	1.2W	1.2W
Heat	1.0W	1.0W	1.0W
Rth	12 °C/W	12 °C/W	12 °C/W
Tj	57 °C	77 °C	97 °C
L_{70%}	64,000hrs	34,000hrs	19,500hrs

ESD Sensitivity test:

Part No.	EDEX-1LCx
Test Quantity	<i>Each 10 pcs</i>
Test Item	ESD-HBM
Test Method	MIL-STD-883E Method 3015.7
Class I	<i>0V ~ 1,999V</i>
Class II	<i>2,000V ~ 3,999V</i>
Class III	<i>4,000V ~ to above</i>
Failure Criteria	<i>IR>5μA@VR=5V</i>
Test Voltage	<i>-100 ~ -500V , Step: -100V -500 ~ -8,000V , Step: -500V</i>
Test Date	<i>18-Mar-05</i>
Test Equipment	<i>Keytek Zapmaster</i>
Test Environmental	<i>25℃±5℃, 55%±10%RH</i>

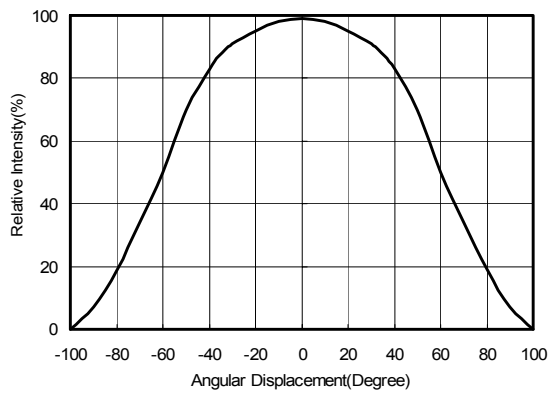
Sample	Voltage(V)		MIL-STD
	Forward	Reverse	
#1	<i>Pass</i>	<i>Pass</i>	Class III
#2	<i>Pass</i>	<i>Pass</i>	Class III
#3	<i>Pass</i>	<i>Pass</i>	Class III
#4	<i>Pass</i>	<i>Pass</i>	Class III
#5	<i>Pass</i>	<i>Pass</i>	Class III
#6	<i>Pass</i>	<i>Pass</i>	Class III
#7	<i>Pass</i>	<i>Pass</i>	Class III
#8	<i>Pass</i>	<i>Pass</i>	Class III
#9	<i>Pass</i>	<i>Pass</i>	Class III
#10	<i>Pass</i>	<i>Pass</i>	Class III

Electrical & Optical Curves-Spectrum

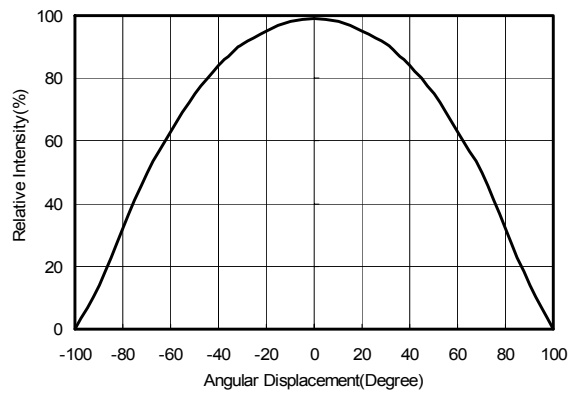


Typical Radiation Pattern for

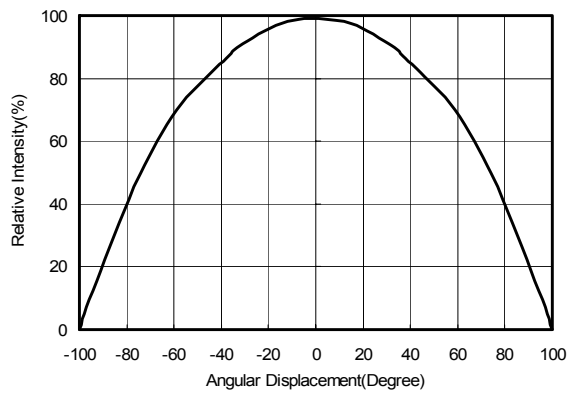
Lambertian



for Red · Amber · Red Orange



for White · Warm white



for Blue · Royal Blue · True Green

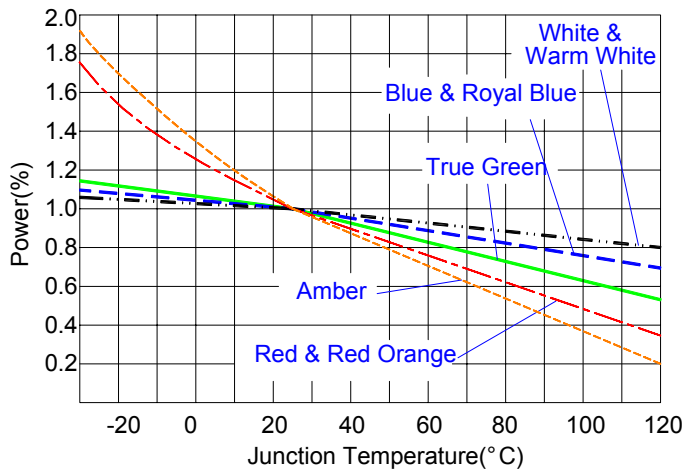
Available Ray Data List

1W Edixeon	Provide Ray source file type	Red	Blue	True Green	White
Lambertian	From ASAP (*.DIS)	⊙	△	△	△
	From Trace Pro (*.DAT)	⊙	△	△	△
	From Radiant Image (*.RSM)	⊙	△	△	△

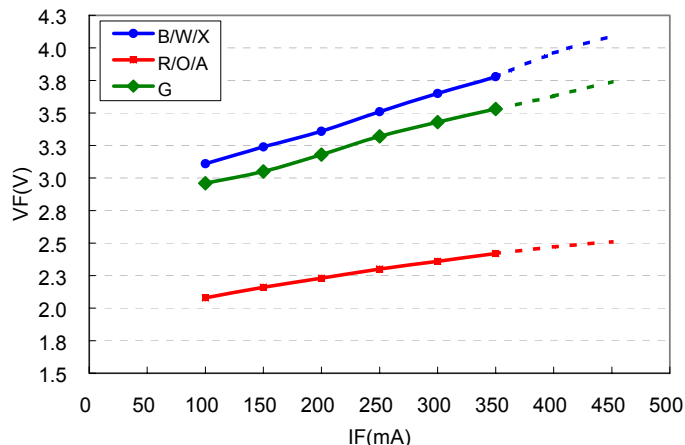
Note:

1. “⊙” → Ready
2. “△” → Not ready

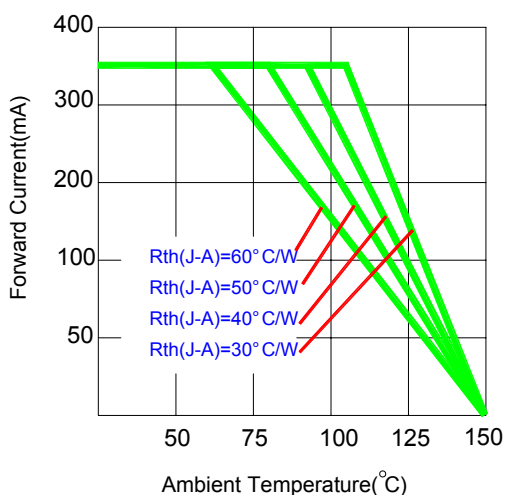
Typical Optical and Electrical Curves



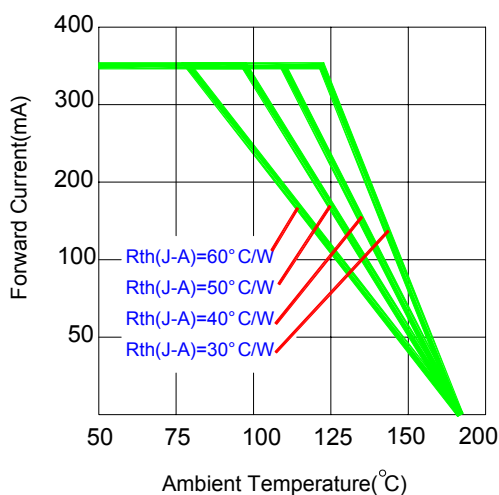
Junction Temperature & Forward Voltage



Operating Current & Forward Voltage

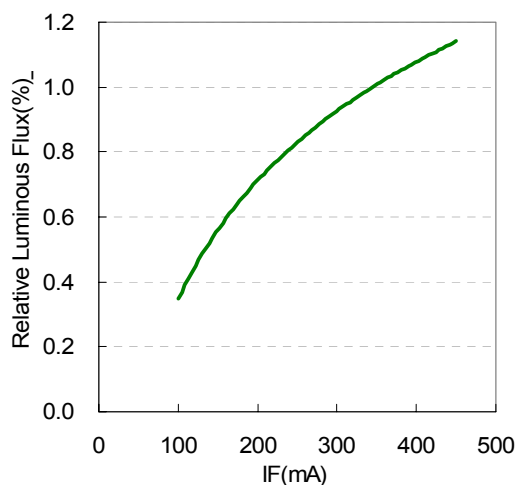


Operating Current & Ambient Temperature
(White, Warm White, Red, Amber, Red Orange)

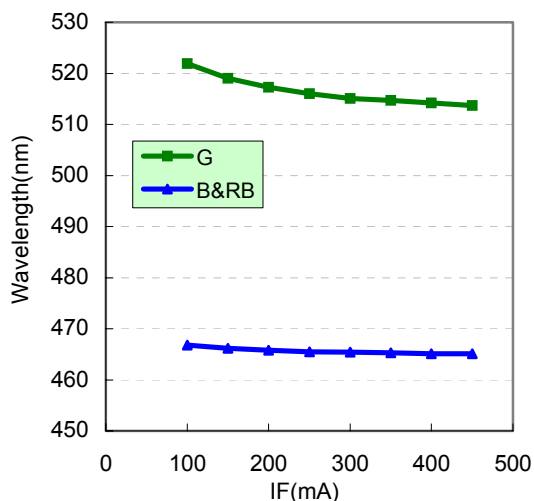


Operating Current & Ambient Temperature
(Blue, Royal Blue, True Green)

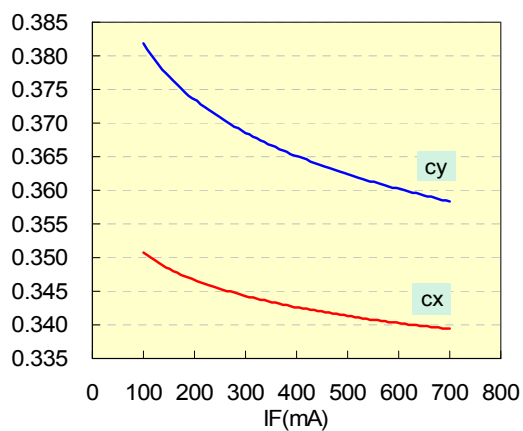
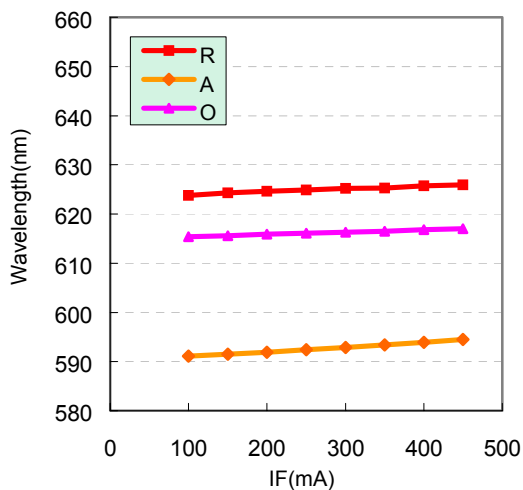
Typical Optical and Electrical Curves



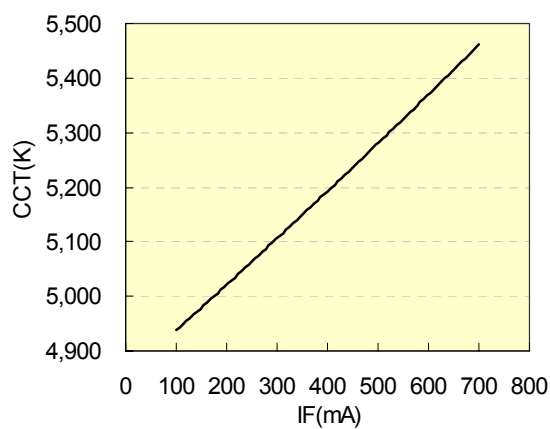
Forward Current & Luminous Flux



Forward Current & Wavelength

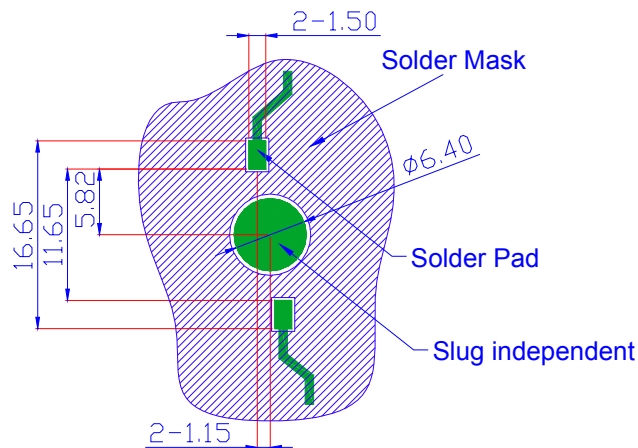


Forward Current & chromaticity coordinate



Forward Current & CCT

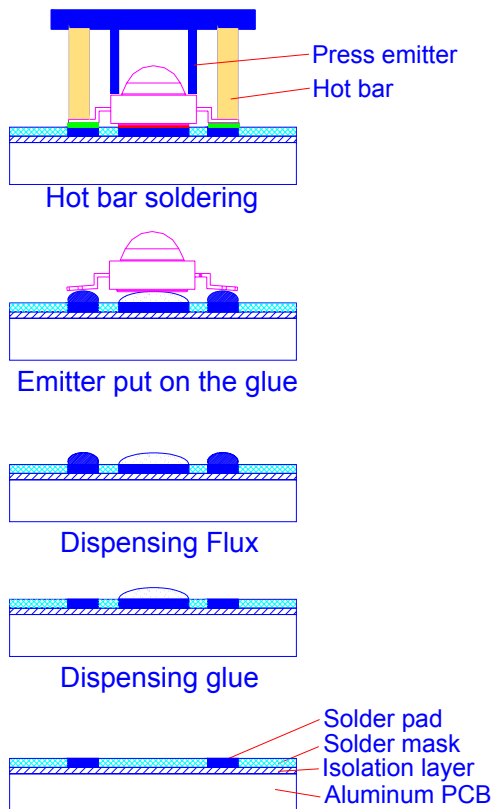
Recommended Solder Pad Design



Note:

1. All dimensions are in mm.
2. Tolerance: ± 0.2 mm
3. Solder pad and slug pad must be independent.

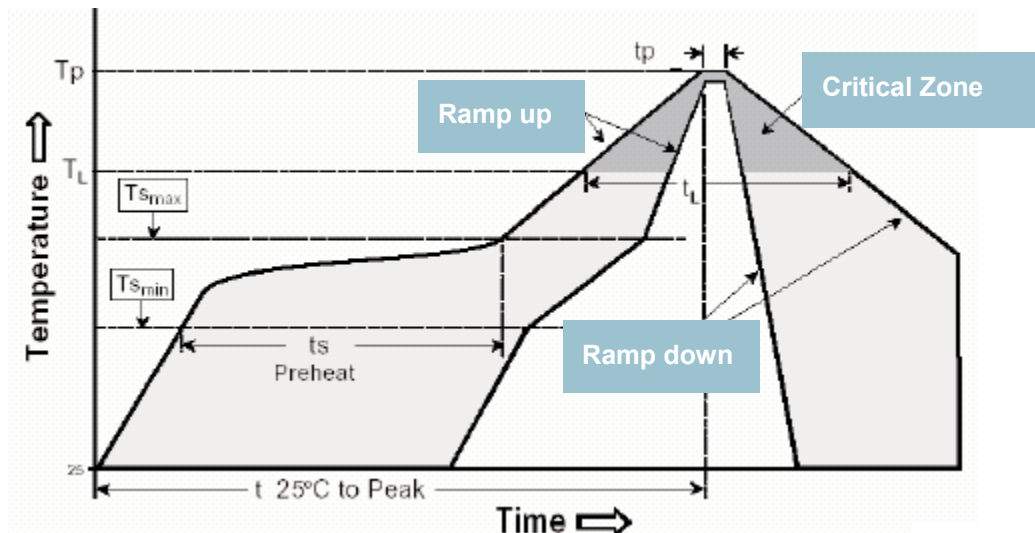
Recommended Solder Steps for hot bar solder



Notes:

1. Aluminum PCB material with a thermal conductivity greater than 2.0 W/mK.
2. If customers use hot bar solder, recommended solder steps is as left. The thermal glue should be as thin as possible for better heat conductivity.
3. If customers use reflow soldering, the profile is suggested as below.
4. During any assembly process touching lens too heavily is avoided. This will cause pollution or scratch on the surface of lens.
5. Thermal glue with a thermal conductivity greater than 1.0 W/mK and the thickness must be less than 100 μ m.

Recommended Profile for Reflow Soldering



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

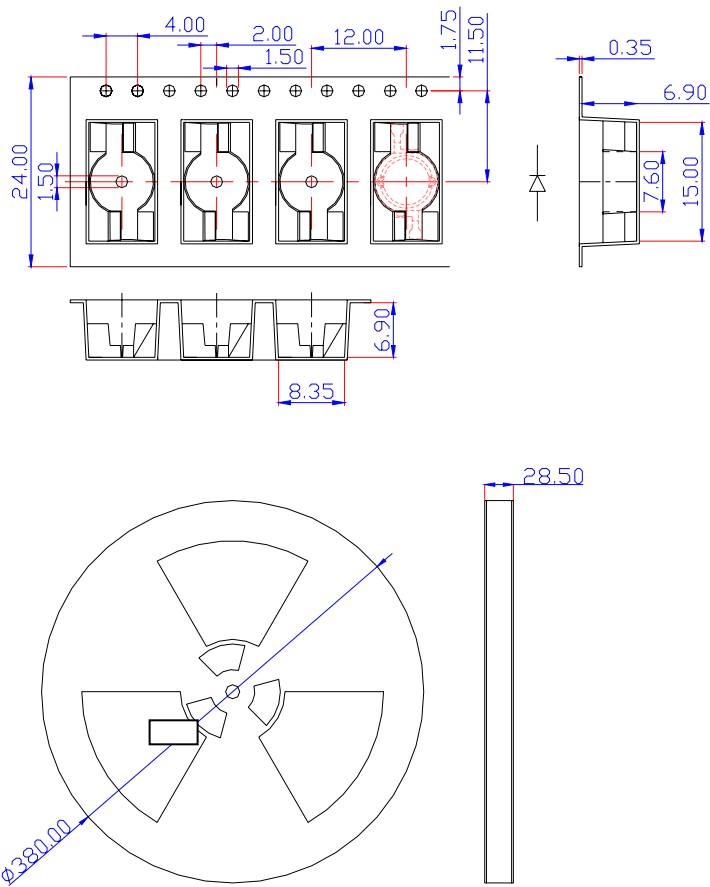
Typical Properties

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



Notes:

1. All dimensions are in mm.
2. There are 1000pcs emitters in full reel
3. There is a reel in a bag
4. There are 2 bags in an inner box
5. There are 5 inner boxes in an outer box
6. A bag contains one humidity indicator card and drying agent

Packing Step	Type	Dimension(mm)	Emitter Q'ty(Max.)
1	Reel	$\Phi 380 \times 28.5$	1,000
2	Inner Box	400*385*56	2,000
3	Outer Box	425*405*320	10,000