



High Power LED

# Edixeon™ Star

1W Edixeon™ Star

Approved By Customer	Designer	Checker	Approval

Date : 2006/08/14

Version : 2.3

Device No. : 3-RD-01-E0007  
**EDISON OPTO CORPORATION**  
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# 1W Edixeon™ Star



Edixeon star is an Edixeon emitter on an Alumina PCB 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. Edixeon white has more than 55 lumens @350mA and over 20 times brighter than standard LEDs. 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
- General lighting
- Contour lights
- Ceiling lights
- Garden lighting
- Decoration lights
- Architectural lighting
- Beacon lights

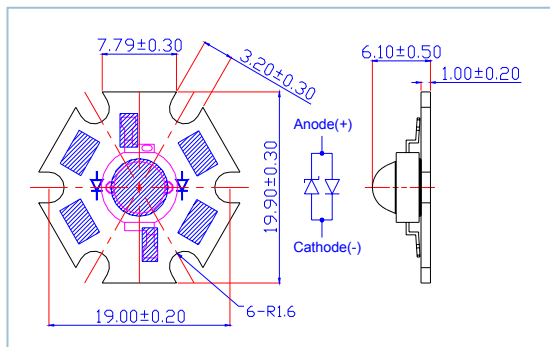
## Edixeon Technology

- $T_{jmax} = 125^{\circ}\text{C}$
- High Lumen performance
- Low thermal resistance  $15-18^{\circ}\text{C/W}$
- Industrial best lumen maintenance — 50,000hrs life at  $I_{Fmax}$  with 70% lumen if  $T_j$  is lower than  $70^{\circ}\text{C}$

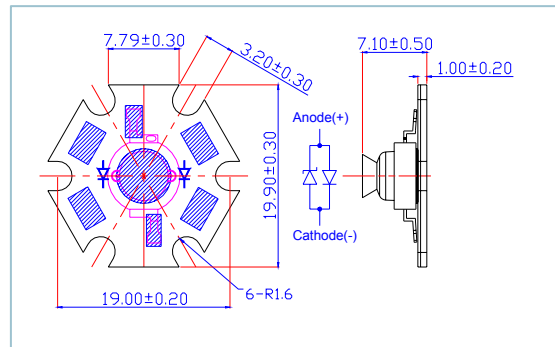


## Package Outlines

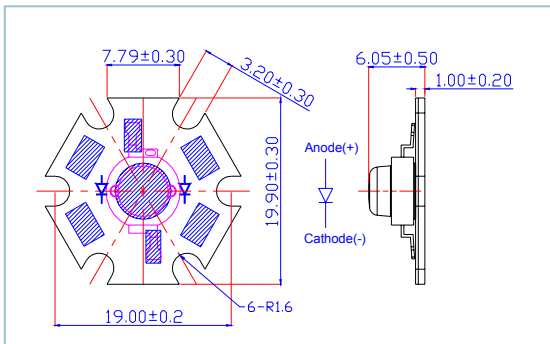
### Lambertian(EDSx-1Lax)



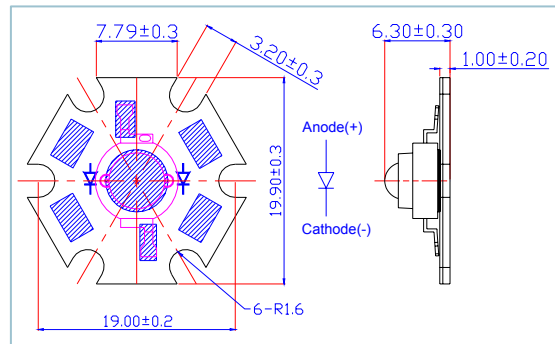
### Side Emitting(EDSx-1SAx)



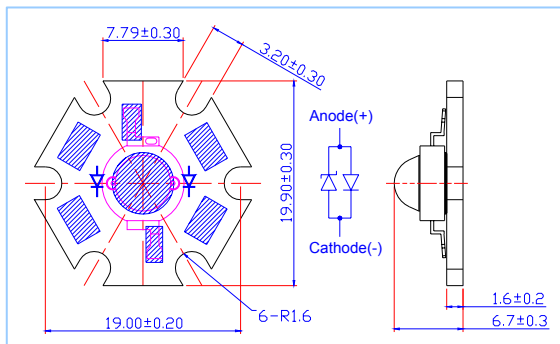
### Batwing(EDSx-1BAx)



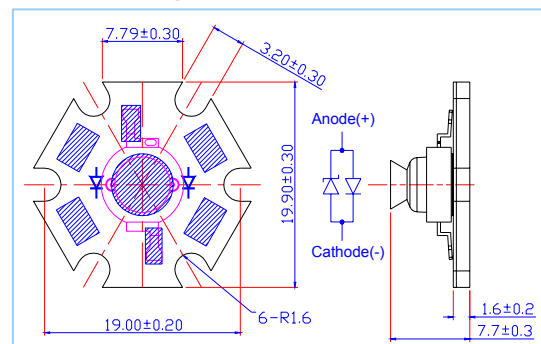
### Focusing(EDSx-1FAx)



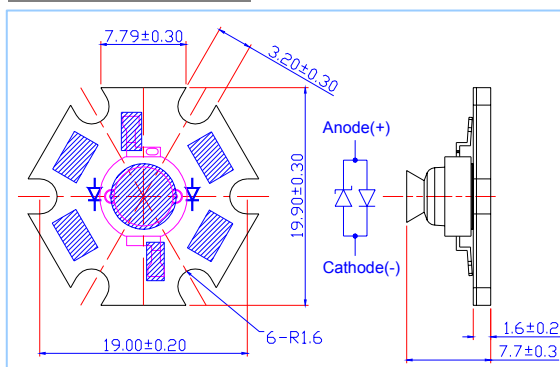
### Lambertian(EDAx-1Lax)



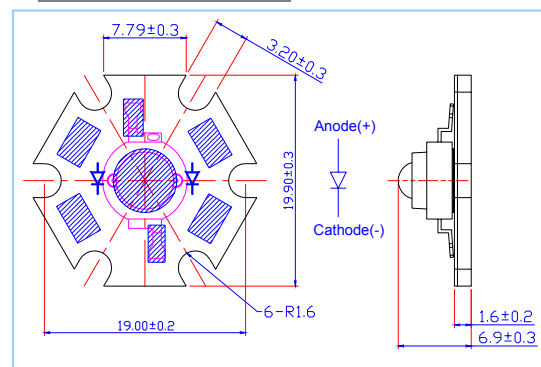
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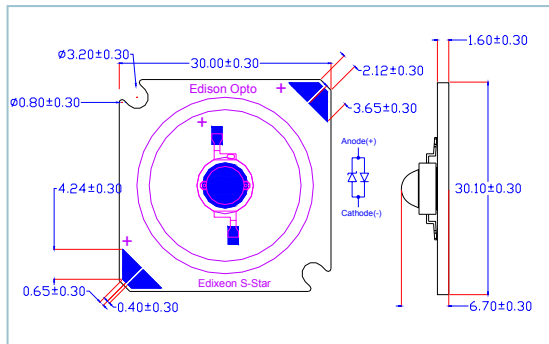
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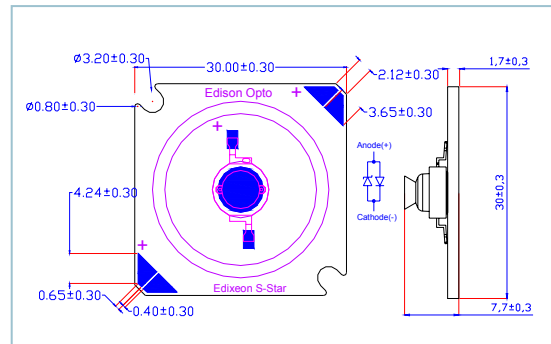
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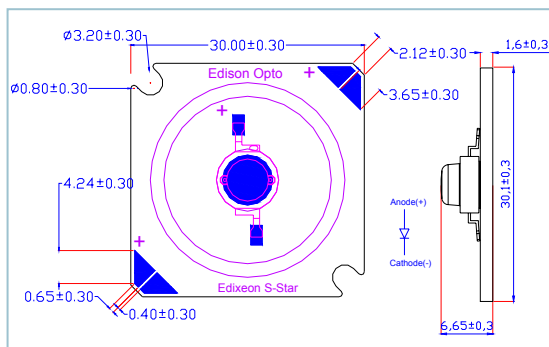
### Lambertian(EDBx-1BAx)



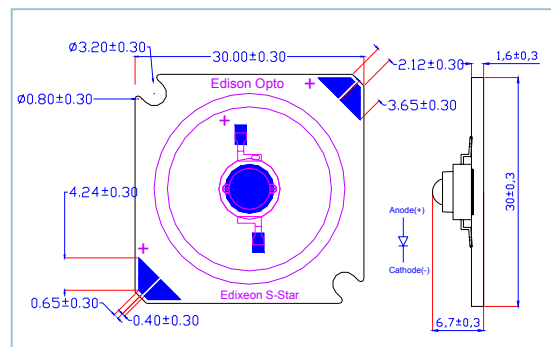
### Side Emitting(EDBx-1BAx)



### Batwing(EDBx-1BAx)



### Focusing(EDBx-1BAx)



### Notes:

1. All dimensions are in mm.
2. Drawings are not to scale.
3. It is strongly recommended that the temperature of lead be not higher than 55°C.
4. Lambertian and side emitting series slug has polarity as anode.
5. It is important that the slug can't contact aluminum surface, It is strongly recommended that there should coat a uniform electrically isolated heat dissipation film on the aluminum surface.

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## 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	$T_j$	125	°C
Operating Temperature	$T_{opr}$	-30 ~ +110	°C
Storage Temperature	$T_{stg}$	-40 ~ +120	°C
ESD Sensitivity (Lambertian and Side emitting)	$V_B$	4,000	V
ESD Sensitivity (Batwing and Focusing)	$V_B$	500	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.

**Luminous Flux & Radiometric Power<sup>[1]</sup> Characteristics at  $I_F=350mA(T_J=25^\circ C)$ :**

Lens Item	Part Name	Color	Flux			Units
			Min.	Typ.	Max.	
<b>Lambertian Side Emitting</b>	<b>EDSW-1xAx</b>	White	<b>30.3</b>	<b>55.0</b>	--	<i>lm</i>
	<b>EDSX-1xAx</b>	Warm White	<b>17.9</b>	<b>35.0</b>	--	<i>lm</i>
	<b>EDSR-1xAx</b>	Red	<b>23.3</b>	<b>40.0</b>	--	<i>lm</i>
	<b>EDSO-1xAx</b>	Red Orange	<b>23.3</b>	<b>45.0</b>	--	<i>lm</i>
	<b>EDSA-1xAx</b>	Amber	<b>23.3</b>	<b>40.0</b>	--	<i>lm</i>
	<b>EDST-1xAx</b>	True Green	<b>30.3</b>	<b>55.0</b>	--	<i>lm</i>
	<b>EDSB-1xAx</b>	Blue	<b>8.2</b>	<b>20.0</b>	--	<i>lm</i>
	<b>EDSC-1xAx</b>	Royal Blue <sup>[1]</sup>	<b>113.9</b>	<b>220</b>	--	<i>mW</i>

Lens Item	Part Name	Color	Flux			Units
			Min.	Typ.	Max.	
<b>Batwing Focusing</b>	<b>EDSW-1xAx</b>	White	<b>30.3</b>	<b>50.0</b>	--	<i>lm</i>
	<b>EDSX-1xAx</b>	Warm White	<b>17.9</b>	<b>32.0</b>	--	<i>lm</i>
	<b>EDSR-1xAx</b>	Red	<b>23.3</b>	<b>38.0</b>	--	<i>lm</i>
	<b>EDSO-1xAx</b>	Red Orange	<b>23.3</b>	<b>42.0</b>	--	<i>lm</i>
	<b>EDSA-1xAx</b>	Amber	<b>23.3</b>	<b>38.0</b>	--	<i>lm</i>
	<b>EDST-1xAx</b>	True Green	<b>30.3</b>	<b>50.0</b>	--	<i>lm</i>
	<b>EDSB-1xAx</b>	Blue	<b>8.2</b>	<b>17.0</b>	--	<i>lm</i>
	<b>EDSC-1xAx</b>	Royal Blue <sup>[1]</sup>	<b>113.9</b>	<b>200</b>	--	<i>mW</i>

**Forward Voltage Characteristics at  $I_F=350mA(T_J=25^\circ C)$ :**

Lens Item	Part Name	Color	$V_F$			Units
			Min.	Typ.	Max.	
<b>Lambertian Side Emitting Batwing Focusing</b>	<b>EDSW-1xAx</b>	White	<b>3.1</b>	--	<b>4.3</b>	<i>V</i>
	<b>EDSX-1xAx</b>	Warm White	<b>3.1</b>	--	<b>4.3</b>	<i>V</i>
	<b>EDSR-1xAx</b>	Red	<b>2.0</b>	--	<b>3.0</b>	<i>V</i>
	<b>EDSO-1xAx</b>	Red Orange	<b>2.0</b>	--	<b>3.0</b>	<i>V</i>
	<b>EDSA-1xAx</b>	Amber	<b>2.0</b>	--	<b>3.0</b>	<i>V</i>
	<b>EDST-1xAx</b>	True Green	<b>2.8</b>	--	<b>4.0</b>	<i>V</i>
	<b>EDSB-1xAx</b>	Blue	<b>3.1</b>	--	<b>4.3</b>	<i>V</i>
	<b>EDSC-1xAx</b>	Royal Blue	<b>3.1</b>	--	<b>4.3</b>	<i>V</i>

**Dominant Wavelength or Peak wavelength<sup>[1]</sup> or Color Temperature**  
**Characteristics at I<sub>F</sub>=350mA(T<sub>J</sub>=25°C):**

Lens Item	Part Name	Color	$\lambda_d/\lambda_p^{[1]}/CCT$			Units
			Min.	Typ.	Max.	
Lambertian Side Emitting Batwing Focusing	EDSW-1xAx	White	5000	--	8000	K
	EDSX-1xAx	Warm White	2800	--	3800	K
	EDSR-1xAx	Red	620	--	630	nm
	EDSO-1xAx	Red Orange	610	--	620	nm
	EDSA-1xAx	Amber	585	--	595	nm
	EDST-1xAx	True Green	515	--	535	nm
	EDSB-1xAx	Blue	460	--	475	nm
	EDSC-1xAx	Royal Blue <sup>[1]</sup>	440	--	460	nm

**Temperature Coefficient of Forward Voltage & Thermal Resistance Junction to Case**  
**Characteristics at I<sub>F</sub>=350mA(T<sub>J</sub>=25°C):**

Lens Item	Part Name	Color	$\Delta V_F/\Delta T$		R <sub>θJ-B</sub>	
			Typ.	Units	Typ.	Units
Lambertian Side Emitting Batwing Focusing	EDSW-1xAx	White	-2	mV/°C	15	°C/W
	EDSX-1xAx	Warm White	-2	mV/°C	15	°C/W
	EDSR-1xAx	Red	-2	mV/°C	18	°C/W
	EDSO-1xAx	Red Orange	-2	mV/°C	18	°C/W
	EDSA-1xAx	Amber	-2	mV/°C	18	°C/W
	EDST-1xAx	True Green	-2	mV/°C	15	°C/W
	EDSB-1xAx	Blue	-2	mV/°C	15	°C/W
	EDSC-1xAx	Royal Blue	-2	mV/°C	15	°C/W

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

Part Name	Color	$2\theta^{1/2}(\text{Typ.})$			Units
		Lambertian	Batwing	Focusing	
<b>EDSW-1xAx</b>	White	<b>130</b>	<b>110</b>	<b>80</b>	Degrees
<b>EDSX-1xAx</b>	Warm White	<b>130</b>	<b>110</b>	<b>80</b>	Degrees
<b>EDSR-1xAx</b>	Red	<b>120</b>	<b>100</b>	<b>35</b>	Degrees
<b>EDSO-1xAx</b>	Red Orange	<b>120</b>	<b>100</b>	<b>35</b>	Degrees
<b>EDSA-1xAx</b>	Amber	<b>120</b>	<b>100</b>	<b>35</b>	Degrees
<b>EDST-1xAx</b>	True Green	<b>150</b>	<b>110</b>	<b>40</b>	Degrees
<b>EDSB-1xAx</b>	Blue	<b>150</b>	<b>110</b>	<b>40</b>	Degrees
<b>EDSC-1xAx</b>	Royal Blue	<b>150</b>	<b>110</b>	<b>40</b>	Degrees

Part Name	Color	$\theta_{\text{PEAK}}(\text{Typ.})$		Units
		Batwing	Side emitting	
<b>EDSW-1xAx</b>	White	<b><math>\pm 40</math></b>	<b><math>\pm 80</math></b>	Degrees
<b>EDSX-1xAx</b>	Warm White	<b><math>\pm 40</math></b>	<b><math>\pm 80</math></b>	Degrees
<b>EDSR-1xAx</b>	Red	<b><math>\pm 35</math></b>	<b><math>\pm 80</math></b>	Degrees
<b>EDSO-1xAx</b>	Red Orange	<b><math>\pm 35</math></b>	<b><math>\pm 80</math></b>	Degrees
<b>EDSA-1xAx</b>	Amber	<b><math>\pm 35</math></b>	<b><math>\pm 80</math></b>	Degrees
<b>EDST-1xAx</b>	True Green	<b><math>\pm 40</math></b>	<b><math>\pm 80</math></b>	Degrees
<b>EDSB-1xAx</b>	Blue	<b><math>\pm 40</math></b>	<b><math>\pm 80</math></b>	Degrees
<b>EDSC-1xAx</b>	Royal Blue	<b><math>\pm 40</math></b>	<b><math>\pm 80</math></b>	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
<b>4</b>	<b>72hours</b>	<b>≤30°C / 60% RH</b>	<b>96 +2/-0</b>	<b>30°C / 60% RH</b>	<b>20 +0.5/-0</b>	<b>60°C / 60% RH</b>

LEVEL	FLOOR LIFE		SOAK REQUIREMENTS			
			STANDARD		ACCELERATED EQUIVALENT <sup>1</sup>	
	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 <sup>2</sup> +5/-0	30°C/80% RH	120 +1/-0	60°C/80% RH
3	168 hours	≤30°C/80% RH	192 <sup>2</sup> +5/-0	30°C/80% RH	40 +1/-0	60°C/80% RH
4	72 hours	≤30°C/80% RH	96 <sup>2</sup> +2/-0	30°C/80% RH	20 +0.5/-0	60°C/80% RH
5	48 hours	≤30°C/80% RH	72 <sup>2</sup> +2/-0	30°C/80% RH	15 +0.5/-0	60°C/80% RH
5a	24 hours	≤30°C/80% RH	48 <sup>2</sup> +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 <sub>F</sub> = max DC (Note 1)	1000 hours	Note 2
High Temperature High Humidity Operating Life	85°C / 85%RH, I <sub>F</sub> = 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<sub>F</sub> shift >=10%

I<sub>R</sub><50uA @V<sub>r</sub>=5V

**Light Output Degradation**

% I<sub>v</sub> shift >= 30% @1,000hrs or 200cycle

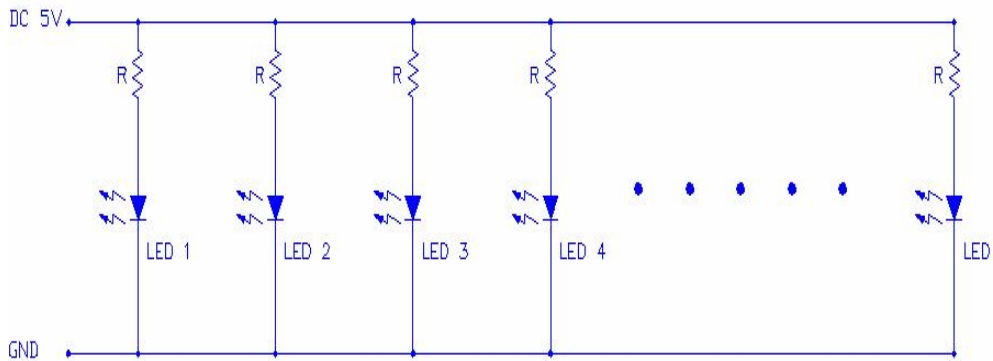
**Visual failures**

Broken or damaged package or lead

Solderability < 95% wetting

Dimension out of tolerance

## Burn-in Condition Edixeon Reliability



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

$$\log(\text{Life}) = \frac{1,600}{T_j(^{\circ}\text{C}) + 273}$$

Life means the time light output becomes 70%

T <sub>j</sub> (°C)	Life (hours)	T <sub>j</sub> (°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)=15°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 30cm<sup>2</sup> Rth=16.7 ΔT(junction-air)=(15+2.4+16.7)x1=34.1 °C

If Area is 60cm<sup>2</sup> Rth=8.3 ΔT(junction-air)=(15+2.4+8.3)x1=25.7 °C

If Area is 90cm<sup>2</sup> Rth=5.5 ΔT(junction-air)=(15+2.4+5.5)x1=22.9 °C

### ASSIST FORM about High Power LED Reliability(White Edixeon)

	<u>Ts=45°C</u>	<u>Ts=65°C</u>	<u>Ts=85°C</u>
<b>Voltage</b>	3.5V	3.5V	3.5V
<b>Current</b>	350mA	350mA	350mA
<b>Wattage</b>	1.2W	1.2W	1.2W
<b>Heat</b>	1.0W	1.0W	1.0W
<b>Rth</b>	15 °C/W	15 °C/W	15 °C/W
<b>Tj</b>	60 °C	80 °C	100 °C
<b>L<sub>70%</sub></b>	64,000hrs	34,000hrs	19,500hrs

**ESD Sensitivity test:**

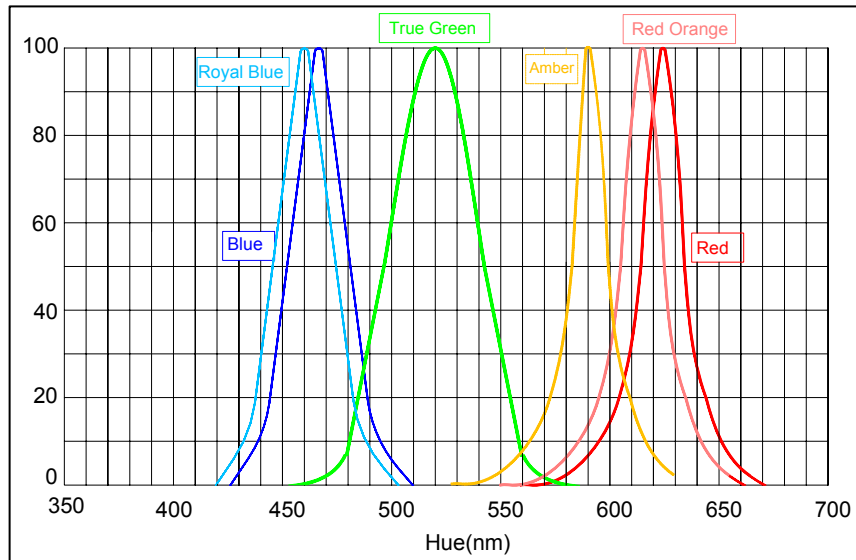
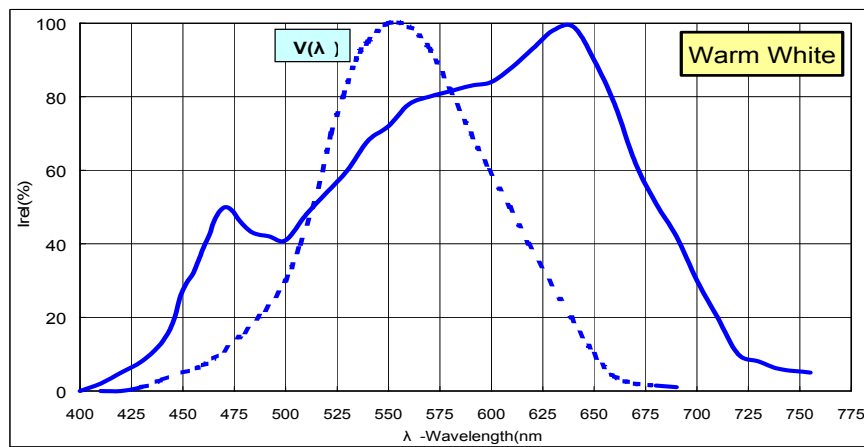
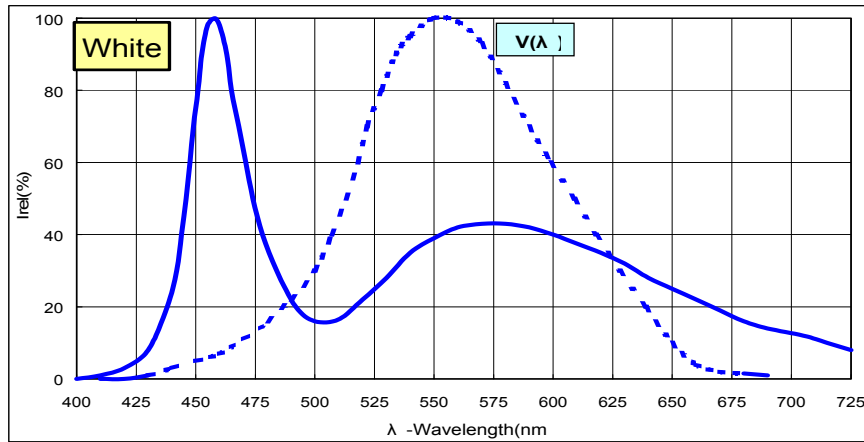
Part No.	<a href="#">EDEX-1xAx</a>
Test Quantity	<i>Each 10 pcs</i>
Test Item	<i>ESD-HBM</i>
Test Method	<i>MIL-STD-883E Method 3015.7</i>
Class I	<i>0V ~ 1,999V</i>
Class II	<i>2,000V ~ 3,999V</i>
Class III	<i>4,000V ~ to above</i>
Failure Criteria	<i>IR&gt;5 μA @VR=5V</i>
Test Voltage	<i>-100 ~ -500V ,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°C±5°C,55%±10%RH</i>

Sample	Voltage(V)		MIL-STD
	Forward	Reverse	
Lambertian	<i>Pass</i>	<i>Pass</i>	<b>Class III</b>
Side emitting	<i>Pass</i>	<i>Pass</i>	<b>Class III</b>
Batwing	<i>Pass</i>	<i>&gt;500</i>	--
Focusing	<i>Pass</i>	<i>&gt;500</i>	--

**Thrust for Edixeon Lens**

Lens Type	Typical Thrust
Lambertian Lens	5 kgf
Batwing Lens	2 kgf
Side Emitting Lens	2 kgf
Focusing Lens	2 kgf

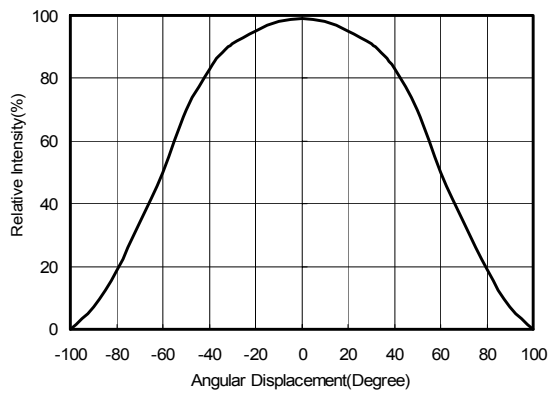
## Electrical & Optical Curves-Spectrum



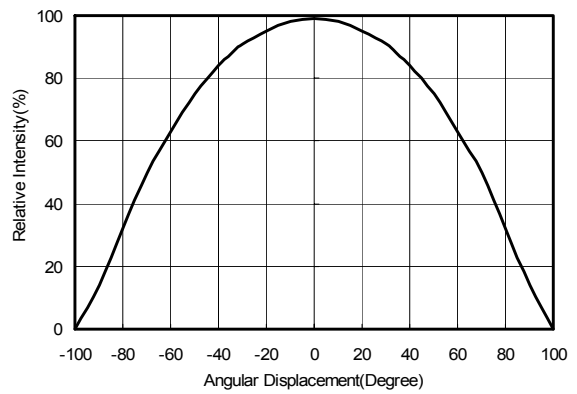
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## Typical Radiation Pattern for

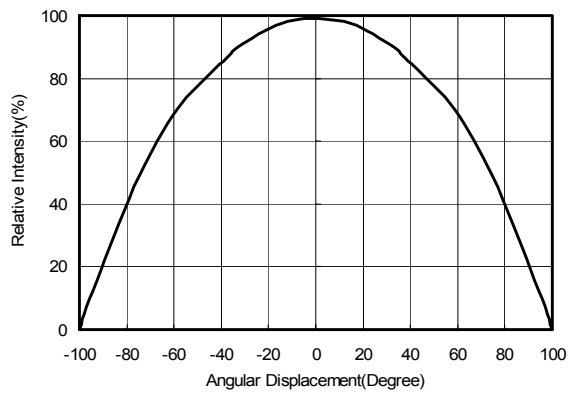
### Lambertian



for Red · Amber · Red Orange

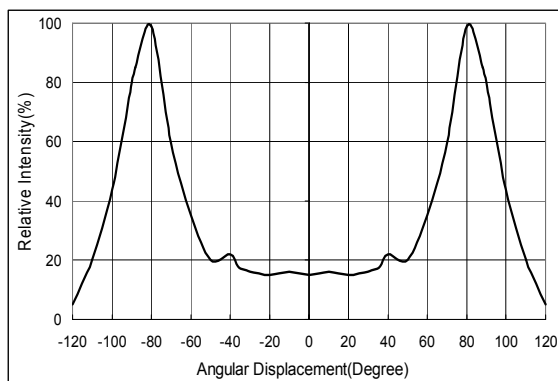


for White · Warm white



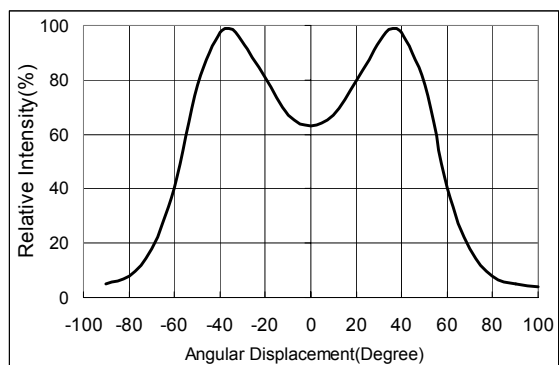
for Blue · Royal Blue · True Green

### Side Emitting (for all colors)

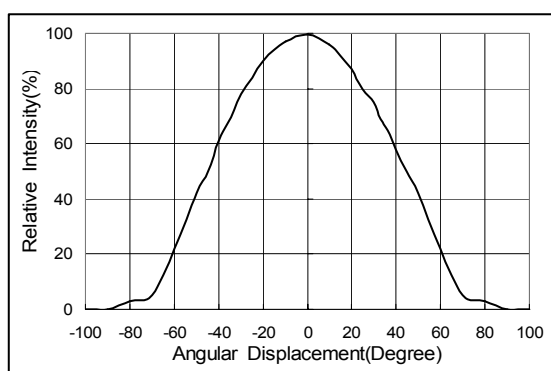


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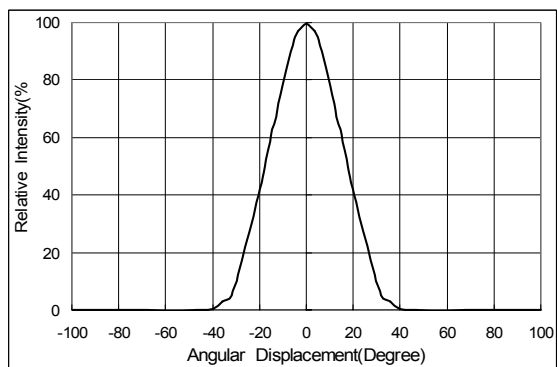
### Batwing (for all colors)



### Focusing



for White 、 Warm White



for Blue 、 Royal Blue 、 True Green  
Red 、 Red Orange 、 Amber



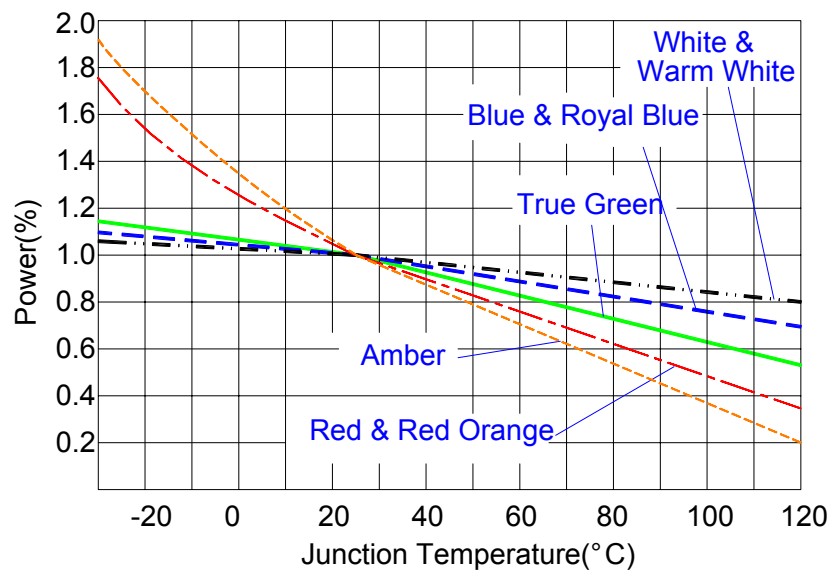
### Available Ray Data List

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

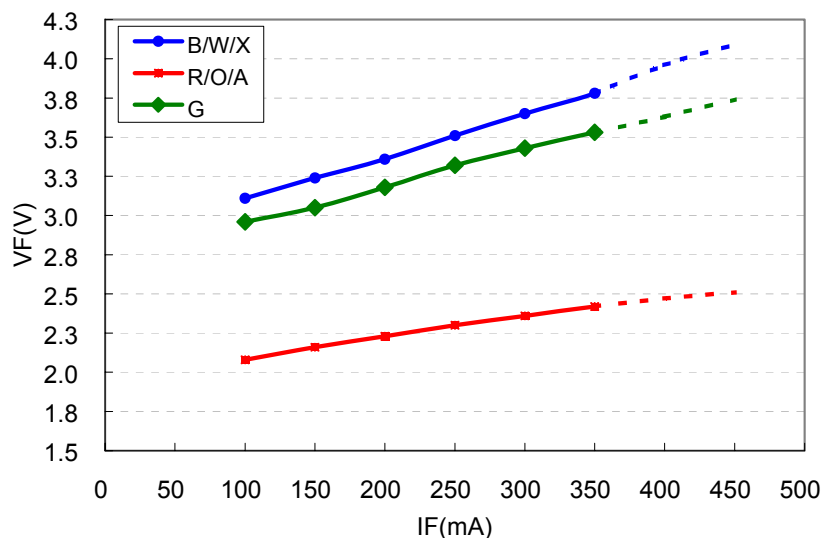
Note:

1. “☉” → Ready
2. “△” → Not ready

**Typical Optical and Electrical Curves**

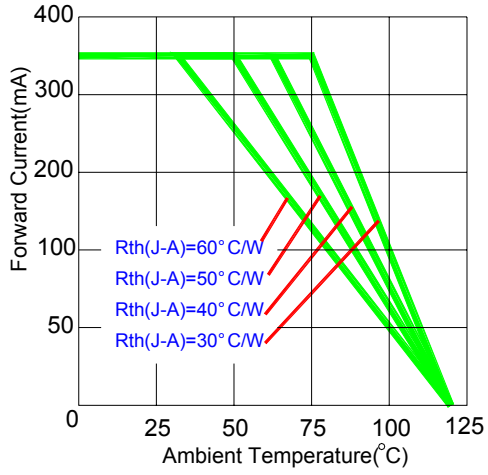


Junction Temperature & Forward Voltage

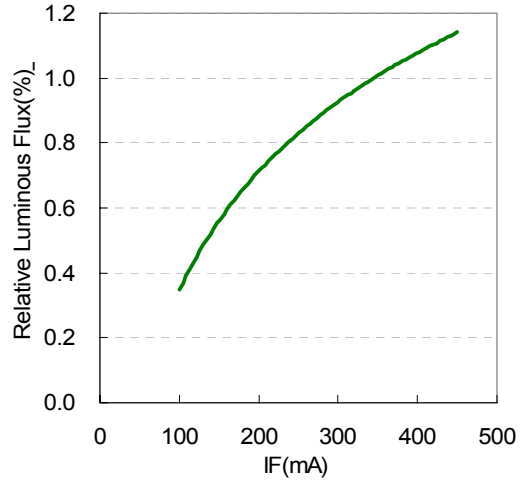


Operating Current & Forward Voltage

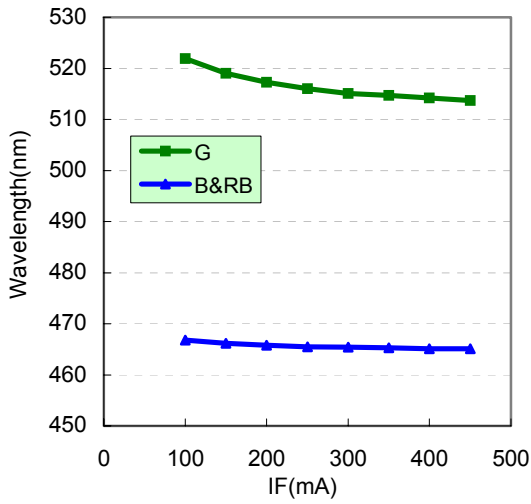
**Typical Optical and Electrical Curves**



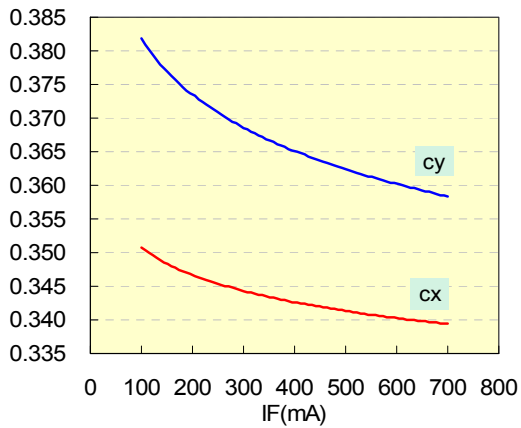
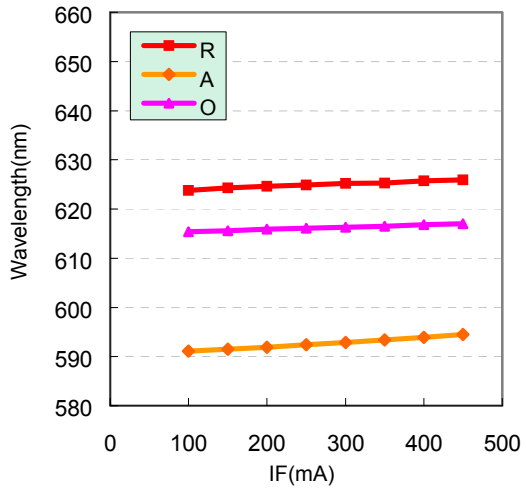
Operating Current & Ambient Temperature



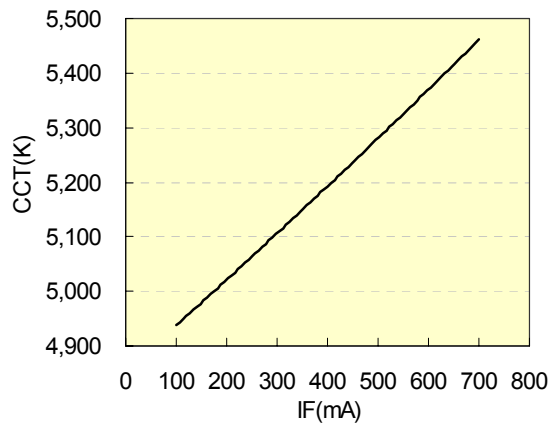
Forward Current & Luminous Flux



Forward Current & Wavelength



Forward Current & chromaticity coordinate



Forward Current & CCT

## Package Specifications

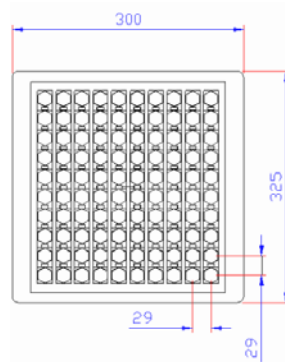
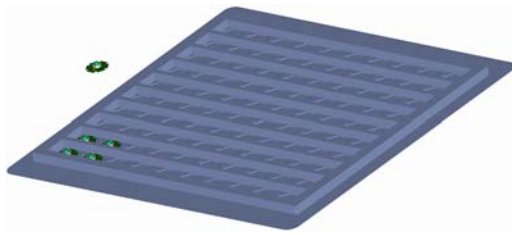


Figure 1: Tray

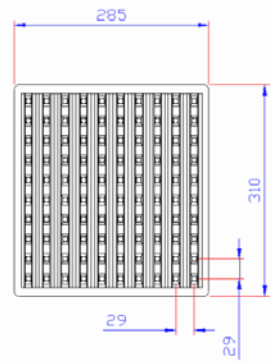


Figure 2: Cover

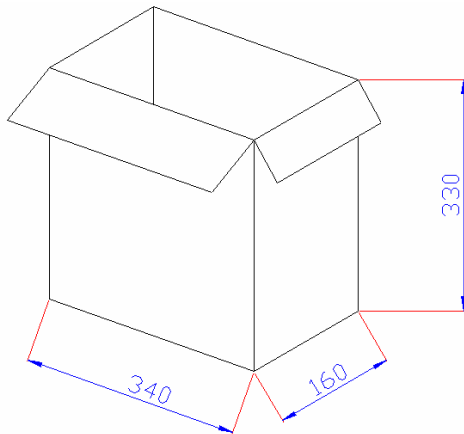


Figure 3: Inner box

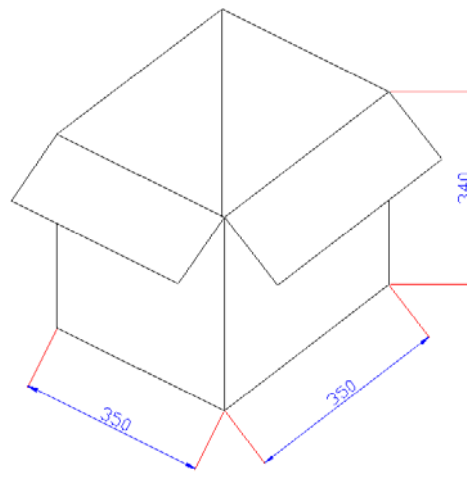


Figure 4: Outer box

### Notes

1. Inner antistatic bag standard.
2. 50pcs emitters per tray (Carrier + Cover)
3. 10 trays per bag and an inner box, 1K pcs per inner box.
4. 2 inner boxes per outer box, 2 K pcs per outer box.

Packing Step	Type	Dimension(mm)	Star Q'ty(Max.)
1	Tray	325*300	100
2	Inner Box	340*160*330	1,000
3	Outer Box	350*350*340	2,000