

# SPECIFICATION

## HPL- H77X X 1 B A

1W

### Lens & Assembly Type :

N : No special Work  
S : with Star  
A : Lens 25°  
B : Lens 45°  
L : Lens 120°  
K : Lens 90°/30°  
P : Lens 100°/50°  
G : Star & Lens 25°  
H : Star & Lens 45°  
F : Star & Lens 120°  
M : Star & Lens 90°/30°  
U : Star & Lens 100°/50°

### Color :

W : White  
S : Warm White  
R : Red  
G : Green  
B : Blue  
A : Amber  
O : Orange

## Caution:

Depends on different chips structures, the thermal pad could has a polarity as Anode. To avoid the risk of circuit-fail, **It is strongly recommended to suppose the condition (Anode – thermal pad)** while designing a circuit.

## Part Number Matrix

### Without Star:

Color \ Type	Flat type	Lens 25°	Lens 45°	Lens 120°	Lens 90°/30°	Lens 100°/50°
White	HPL-H77NW1BA	HPL-H77AW1BA	HPL-H77BW1BA	HPL-H77LW1BA	HPL-H77KW1BA	HPL-H77PW1BA
Warm White	HPL-H77NS1BA	HPL-H77AS1BA	HPL-H77BS1BA	HPL-H77LS1BA	HPL-H77KS1BA	HPL-H77PS1BA
Red	HPL-H77NR1BA	HPL-H77AR1BA	HPL-H77BR1BA	HPL-H77LR1BA	HPL-H77KR1BA	HPL-H77PR1BA
Green	HPL-H77NG1BA	HPL-H77AG1BA	HPL-H77BG1BA	HPL-H77LG1BA	HPL-H77KG1BA	HPL-H77PG1BA
Blue	HPL-H77NB1BA	HPL-H77AB1BA	HPL-H77BB1BA	HPL-H77LB1BA	HPL-H77KB1BA	HPL-H77PB1BA
Amber	HPL-H77NA1BA	HPL-H77AA1BA	HPL-H77BA1BA	HPL-H77LA1BA	HPL-H77KA1BA	HPL-H77PA1BA
Orange	HPL-H77NO1BA	HPL-H77AO1BA	HPL-H77BO1BA	HPL-H77LO1BA	HPL-H77KO1BA	HPL-H77PO1BA

### With Star:

Color \ Type	Star & Flat type	Star & Lens 25°	Star & Lens 45°	Star & Lens 120°	Star & Lens 90°/30°	Star & Lens 100°/50°
White	HPL-H77SW1BA	HPL-H77GW1BA	HPL-H77HW1BA	HPL-H77FW1BA	HPL-H77MW1BA	HPL-H77UW1BA
Warm White	HPL-H77SS1BA	HPL-H77GS1BA	HPL-H77HS1BA	HPL-H77FS1BA	HPL-H77MS1BA	HPL-H77US1BA
Red	HPL-H77SR1BA	HPL-H77GR1BA	HPL-H77HR1BA	HPL-H77FR1BA	HPL-H77MR1BA	HPL-H77UR1BA
Green	HPL-H77SG1BA	HPL-H77GG1BA	HPL-H77HG1BA	HPL-H77FG1BA	HPL-H77MG1BA	HPL-H77UG1BA
Blue	HPL-H77SB1BA	HPL-H77GB1BA	HPL-H77HB1BA	HPL-H77FB1BA	HPL-H77MB1BA	HPL-H77UB1BA
Amber	HPL-H77SA1BA	HPL-H77GA1BA	HPL-H77HA1BA	HPL-H77FA1BA	HPL-H77MA1BA	HPL-H77UA1BA
Orange	HPL-H77SO1BA	HPL-H77GO1BA	HPL-H77HO1BA	HPL-H77FO1BA	HPL-H77MO1BA	HPL-H77UO1BA

## 1. Features

- Dimension : 7.0mm(L)×7.0mm(W)
- 1W High Flux type
- All Metal Design Cu PCB/Al reflector
- Low thermal resistance
- The InGaN or AlInGaP Chip inside
- Superior ESD protection

## 2. Application

- Traffic signaling
- Backlighting
- Interior & exterior automotive lighting
- Decorative and landscape lighting
- Signage and channel letter
- Portable light source
- Decorating and entertainment lighting
- Architectural lighting
- Street lighting

## 3. Absolute Maximum Ratings

(T<sub>j</sub>=25°C)

Parameter		Symbol	Rating	Unit
Power Dissipation	White	P	1.5	W
	Warm White		1.5	
	Red		1.05	
	Green		1.5	
	Blue		1.5	
	Amber		1.05	
	Orange		1.05	
Forward Current		IF	350	mA
Forward Pulse Current (1/10 Duty Cycle, 400msec Pulse Width)		IFP	500	mA
Thermal Resistance, Junction-Case		Rth, J-C1	10	°C/W
Reverse Voltage		VR	5	V
LED Junction Temperature		T <sub>j</sub>	125	°C
Operating Temperature Range		Topr	-40°C to + 80°C	
Storage Temperature Range		Tstg	-40°C to + 120°C	
Soldering Condition		Tsol	260°C For 5 Seconds	

Note: 1. The thermal resistance value is measured with MCPCB (Star).

## 4. Initial Electrical/Optical Characteristics

- Forward Voltage**

(Tj=25°C)

Color	Forward Voltage					
	Symbol	MIN.	TYP.	MAX.	Test Condition	Unit
White	V <sub>F</sub>	3.03	3.80	4.23	I <sub>F</sub> = 350mA	V
Warm White	V <sub>F</sub>	3.03	3.80	4.23	I <sub>F</sub> = 350mA	V
Red	V <sub>F</sub>	1.83	2.50	3.03	I <sub>F</sub> = 350mA	V
Green	V <sub>F</sub>	3.03	3.80	4.23	I <sub>F</sub> = 350mA	V
Blue	V <sub>F</sub>	3.03	3.80	4.23	I <sub>F</sub> = 350mA	V
Amber	V <sub>F</sub>	1.83	2.50	3.03	I <sub>F</sub> = 350mA	V
Orange	V <sub>F</sub>	1.83	2.50	3.03	I <sub>F</sub> = 350mA	V

- Reverse Current**

(Tj=25°C)

Color	Reverse Current					
	Symbol	MIN.	TYP.	MAX.	Test Condition	Unit
White	I <sub>R</sub>	-	-	-	V <sub>R</sub> = 5V	μA
Warm White	I <sub>R</sub>	-	-	-	V <sub>R</sub> = 5V	μA
Red	I <sub>R</sub>	-	-	100	V <sub>R</sub> = 5V	μA
Green	I <sub>R</sub>	-	-	-	V <sub>R</sub> = 5V	μA
Blue	I <sub>R</sub>	-	-	-	V <sub>R</sub> = 5V	μA
Amber	I <sub>R</sub>	-	-	100	V <sub>R</sub> = 5V	μA
Orange	I <sub>R</sub>	-	-	100	V <sub>R</sub> = 5V	μA

- Luminous Flux**

(Tj=25°C)

Color	Luminous Flux ( With Lens type / Flat type )
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	Symbol	MIN.	TYP.	MAX.	Test Condition	Unit
White	$\Phi_V$	-	70/59	-	$I_F = 350\text{mA}$	lm
Warm White	$\Phi_V$	-	50/42	-	$I_F = 350\text{mA}$	lm
Red	$\Phi_V$	-	40/33	-	$I_F = 350\text{mA}$	lm
Green	$\Phi_V$	-	60/50	-	$I_F = 350\text{mA}$	lm
Blue	$\Phi_V$	-	12/10	-	$I_F = 350\text{mA}$	lm
Amber	$\Phi_V$	-	37/31	-	$I_F = 350\text{mA}$	lm
Orange	$\Phi_V$	-	42/35	-	$I_F = 350\text{mA}$	lm

- Radiometric Power**

(T<sub>j</sub>=25°C)

Color	Luminous Flux ( With Lens type / Flat type )					
	Symbol	MIN.	TYP.	MAX.	Test Condition	Unit
Blue <sup>1</sup>	$\Phi_V$	-	200/180	-	$I_F = 350\text{mA}$	mW

- Color Temperature or Dominate wavelength**

(T<sub>j</sub>=25°C)

Color	Color Temperature or Dominate Wavelength					
	Symbol	MIN.	TYP.	MAX.	Test Condition	Unit
White	CCT	4500	5600	10000	$I_F = 350\text{mA}$	°K
Warm White	CCT	2800	3500	4500	$I_F = 350\text{mA}$	°K
Red	$\lambda_d$	620	-	630	$I_F = 350\text{mA}$	nm
Green	$\lambda_d$	520	-	540	$I_F = 350\text{mA}$	nm
Blue <sup>1</sup>	$\lambda_d$	450	-	470	$I_F = 350\text{mA}$	nm
Amber	$\lambda_d$	585	-	595	$I_F = 350\text{mA}$	nm
Orange	$\lambda_d$	610	-	620	$I_F = 350\text{mA}$	nm

Note: 1. Royal Blue Products: Wavelength defined is Peak Wavelength ( $\lambda_p = 450 \sim 460\text{nm}$ ).

- View Angle**

(T<sub>j</sub>=25°C)

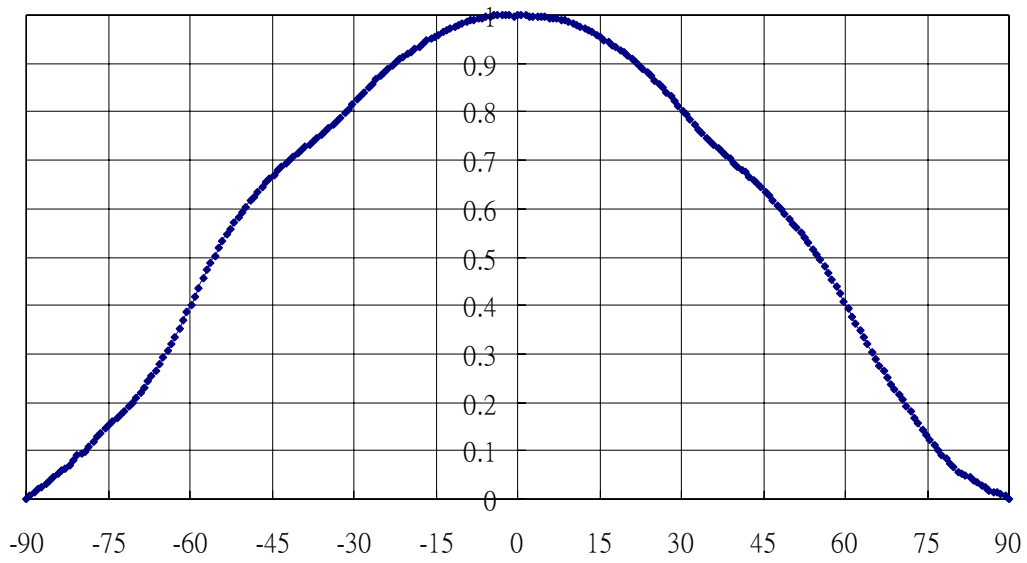
Color	Viewing Angle						
	Symbol	Flat type	120° Lens	25° Lens	45° Lens	Test Condition	Unit

White	2θ <sub>1/2</sub>	110	120	25	45	I <sub>F</sub> = 350mA	degree
Warm White							
Red							
Green							
Blue							
Amber							
Orange							

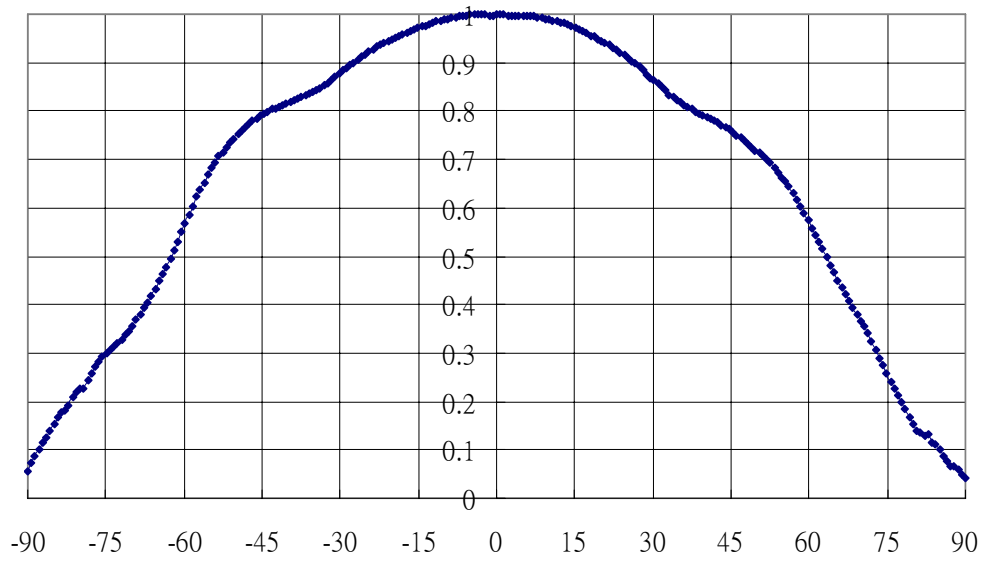
Color	Viewing Angle				
	Symbol	90°/30° Lens	100°/50° Lens	Test Condition	Unit
White	2θ <sub>1/2</sub>	90/30	100/50	I <sub>F</sub> = 350mA	degree
Warm White					
Red					
Green					
Blue					
Amber					
Orange					

- **Typical Radiation Pattern**

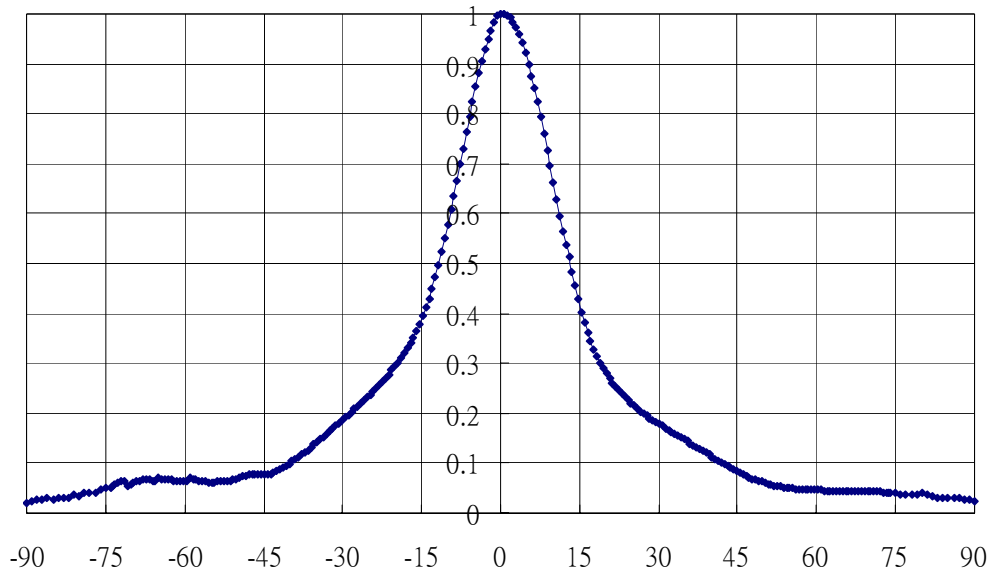
Flat Type



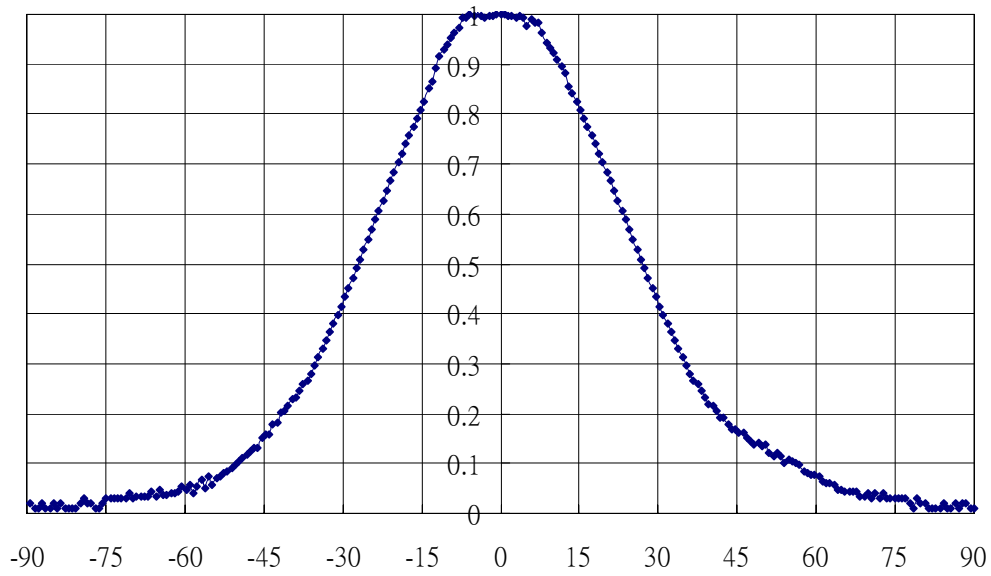
**120° Lens**



**25° Lens**

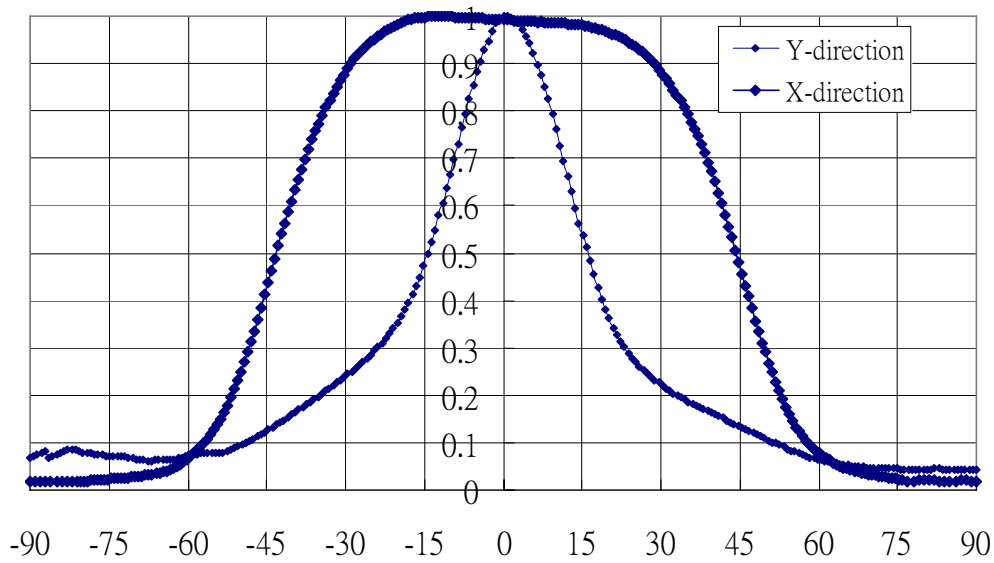


**45° Lens**

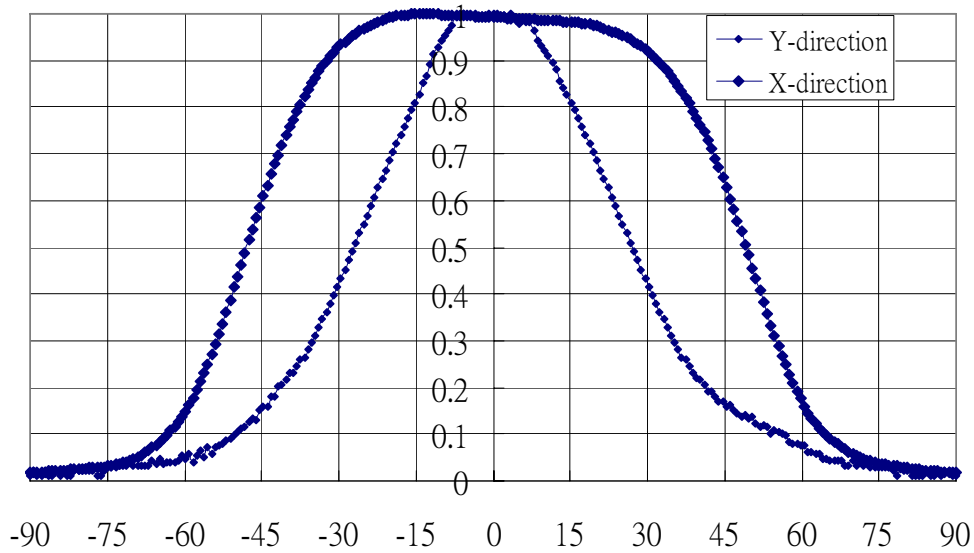


**90°/30° Lens**





100°/50° Lens



● **Bin Code List for Reference**

(T<sub>j</sub>=25°C)

Item	Bin Code	Symbol	Condition	Min.	Max.	Unit
Forward Voltage <sup>1</sup>	C	V <sub>F</sub>	I <sub>F</sub> = 350 [mA]	1.83	2.07	V

	D			2.07	2.31	
	E			2.31	2.55	
	F			2.55	2.79	
	G			2.79	3.03	
	H			3.03	3.27	
	J			3.27	3.51	
	K			3.51	3.75	
	L			3.75	3.99	
	M			3.99	4.23	
Luminous Flux <sup>2</sup>	K	$\Phi_V$	$I_F = 350$ [mA]	6.3	8.2	lm
	L			8.2	10.7	
	M			10.7	13.9	
	N			13.9	18.1	
	O			18.1	23.5	
	P			23.5	30.6	
	Q			30.6	39.8	
	R			39.8	51.7	
	S			51.7	67.2	
	T			67.2	87.4	
	U			87.4	114	
	V			114	148	
W	148	192				

Note: 1. Forward voltage measurement allowance is  $\pm 0.1V$ .

2. Luminous flux measurement allowance is  $\pm 10\%$ .

### Hue Bin Specification for White

Bin Code		CIE 1931 x, y Range				Typical CCT (°K)
UO	x	0.362	0.360	0.344	0.346	4500~5000

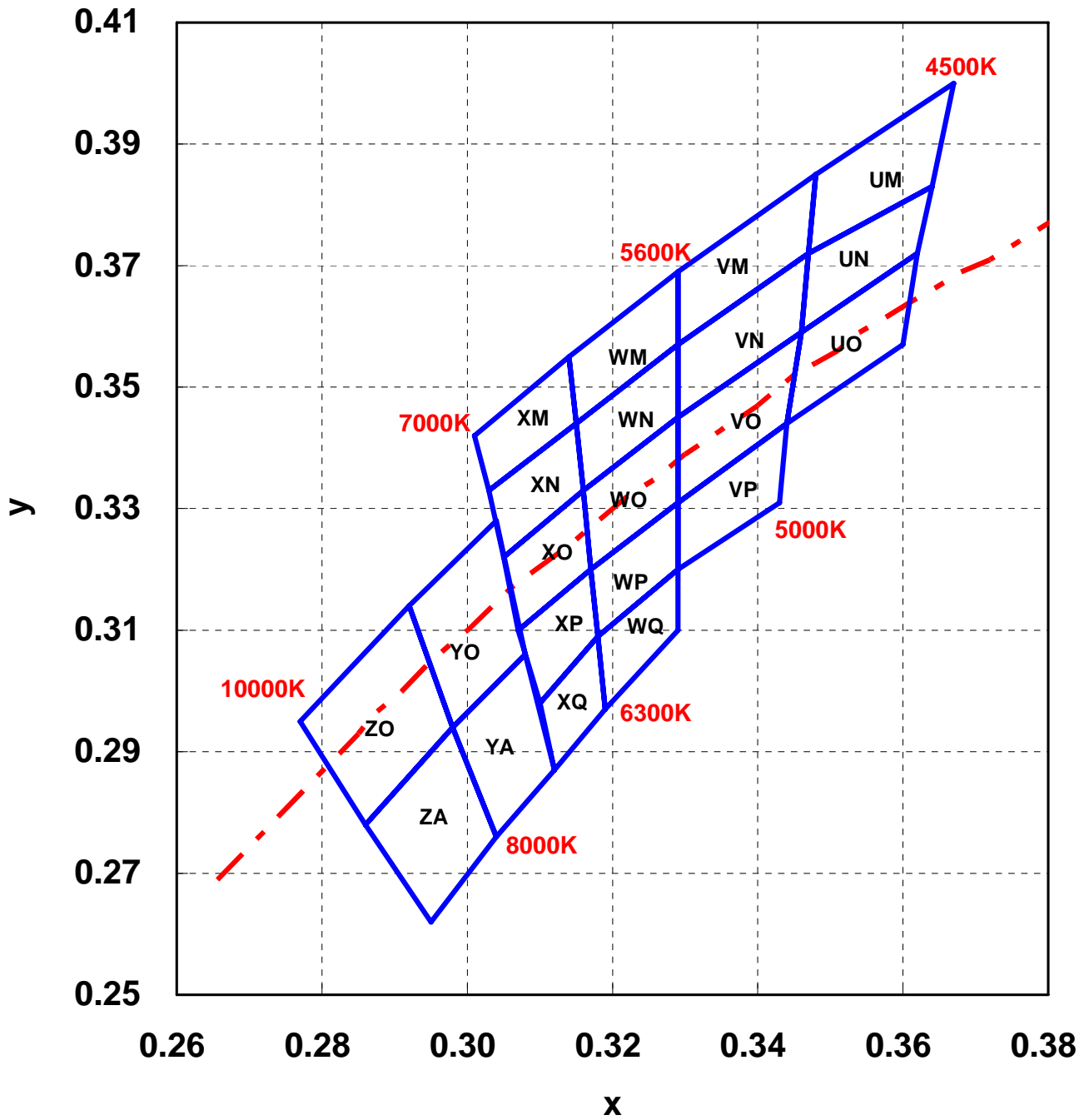
	y	0.372	0.357	0.344	0.359	
UN	x	0.364	0.362	0.346	0.347	
	y	0.383	0.372	0.359	0.372	
UM	x	0.367	0.364	0.347	0.348	
	y	0.400	0.383	0.372	0.385	
PO	x	0.344	0.343	0.329	0.329	5000~5600
	y	0.344	0.331	0.320	0.331	
VO	x	0.346	0.344	0.329	0.329	
	y	0.359	0.344	0.331	0.345	
VN	x	0.347	0.346	0.329	0.329	
	y	0.372	0.359	0.345	0.357	
VM	x	0.348	0.347	0.329	0.329	
	y	0.385	0.372	0.357	0.369	
WQ	x	0.329	0.329	0.319	0.318	5600~6000
	y	0.320	0.310	0.297	0.309	
WP	x	0.329	0.329	0.318	0.317	
	y	0.331	0.320	0.309	0.320	
WO	x	0.329	0.329	0.317	0.316	
	y	0.345	0.331	0.320	0.333	
WN	x	0.329	0.329	0.316	0.315	
	y	0.357	0.345	0.333	0.344	
WM	x	0.329	0.329	0.315	0.314	
	y	0.369	0.357	0.344	0.355	

Bin Code		CIE 1931 x, y Range				Typical CCT (°K)
XQ	x	0.318	0.319	0.312	0.310	6300~7000
	y	0.309	0.297	0.287	0.298	
XP	x	0.317	0.318	0.310	0.307	

	y	0.320	0.309	0.298	0.310	
XO	x	0.316	0.317	0.307	0.305	
	y	0.333	0.320	0.310	0.322	
XN	x	0.315	0.316	0.305	0.303	
	y	0.344	0.333	0.322	0.333	
XM	x	0.314	0.315	0.303	0.301	
	y	0.355	0.344	0.333	0.342	
YA	x	0.308	0.312	0.304	0.298	7000~8000
	y	0.306	0.287	0.276	0.294	
YO	x	0.304	0.308	0.298	0.292	
	y	0.328	0.306	0.294	0.314	
ZA	x	0.298	0.304	0.295	0.286	8000~10000
	y	0.294	0.276	0.262	0.278	
ZO	x	0.292	0.298	0.286	0.277	
	y	0.314	0.294	0.278	0.295	

Note: The CIE1931 x, y color coordinates measurement allowance is  $\pm 0.01$ .

### CIE 1931 Diagram Hue Bin Specification for White

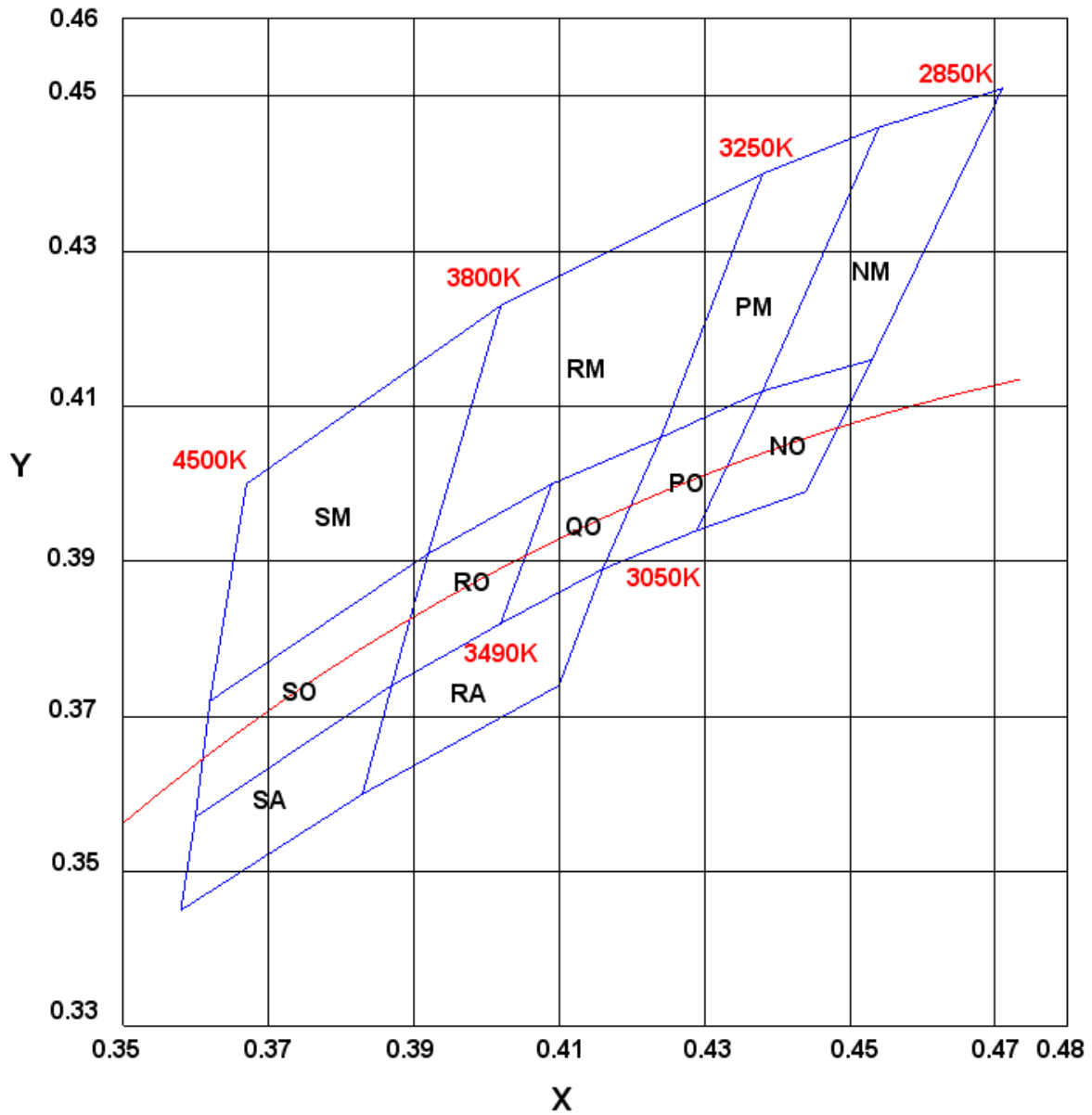


## Hue Bin Specification for Warm White

Bin Code		CIE 1931 x, y Range				Typical CCT (°K)	
SM	x	0.367	0.402	0.392	0.362	3800~4500	
	y	0.400	0.423	0.391	0.372		
SO	x	0.362	0.392	0.387	0.360		
	y	0.372	0.391	0.374	0.357		
SA	x	0.360	0.387	0.383	0.358		
	y	0.357	0.374	0.360	0.345		
RM	x	0.402	0.438	0.424	0.392		3250~3800
	y	0.423	0.440	0.406	0.391		
RA	x	0.387	0.416	0.410	0.383		
	y	0.374	0.389	0.374	0.360		
RO	x	0.392	0.409	0.402	0.387		
	y	0.391	0.399	0.382	0.374		
QO	x	0.409	0.424	0.416	0.402		
	y	0.399	0.406	0.389	0.382		
PM	x	0.438	0.454	0.438	0.424	3050~3250	
	y	0.440	0.446	0.412	0.406		
PO	x	0.424	0.438	0.429	0.416		
	y	0.406	0.412	0.394	0.389		
NM	x	0.454	0.471	0.453	0.438	2850~3050	
	y	0.446	0.451	0.416	0.412		
NO	x	0.438	0.453	0.444	0.429		
	y	0.412	0.416	0.399	0.394		

Note: . The CIE1931 x, y color coordinates measurement allowance is  $\pm 0.01$ .

# CIE 1931 Diagram Hue Bin Specification for Warm white



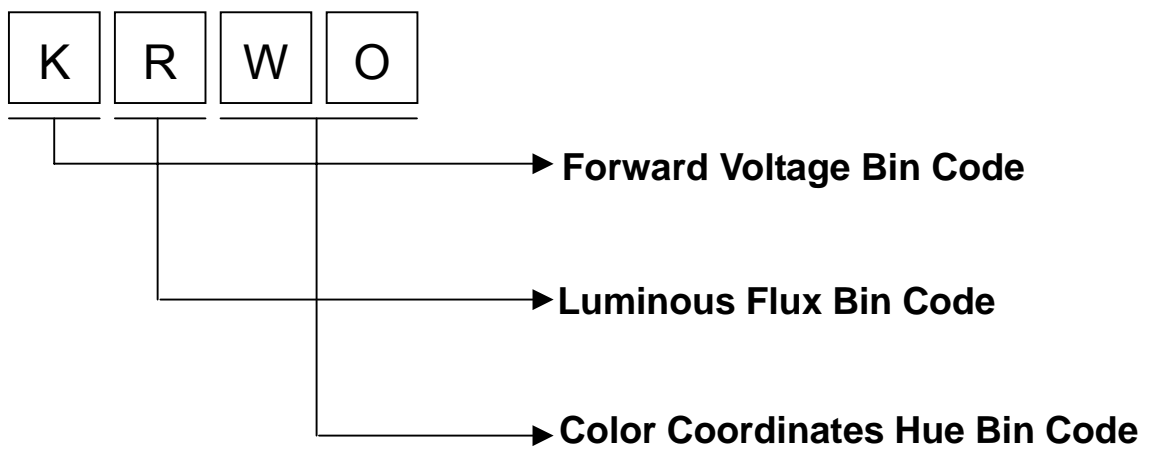
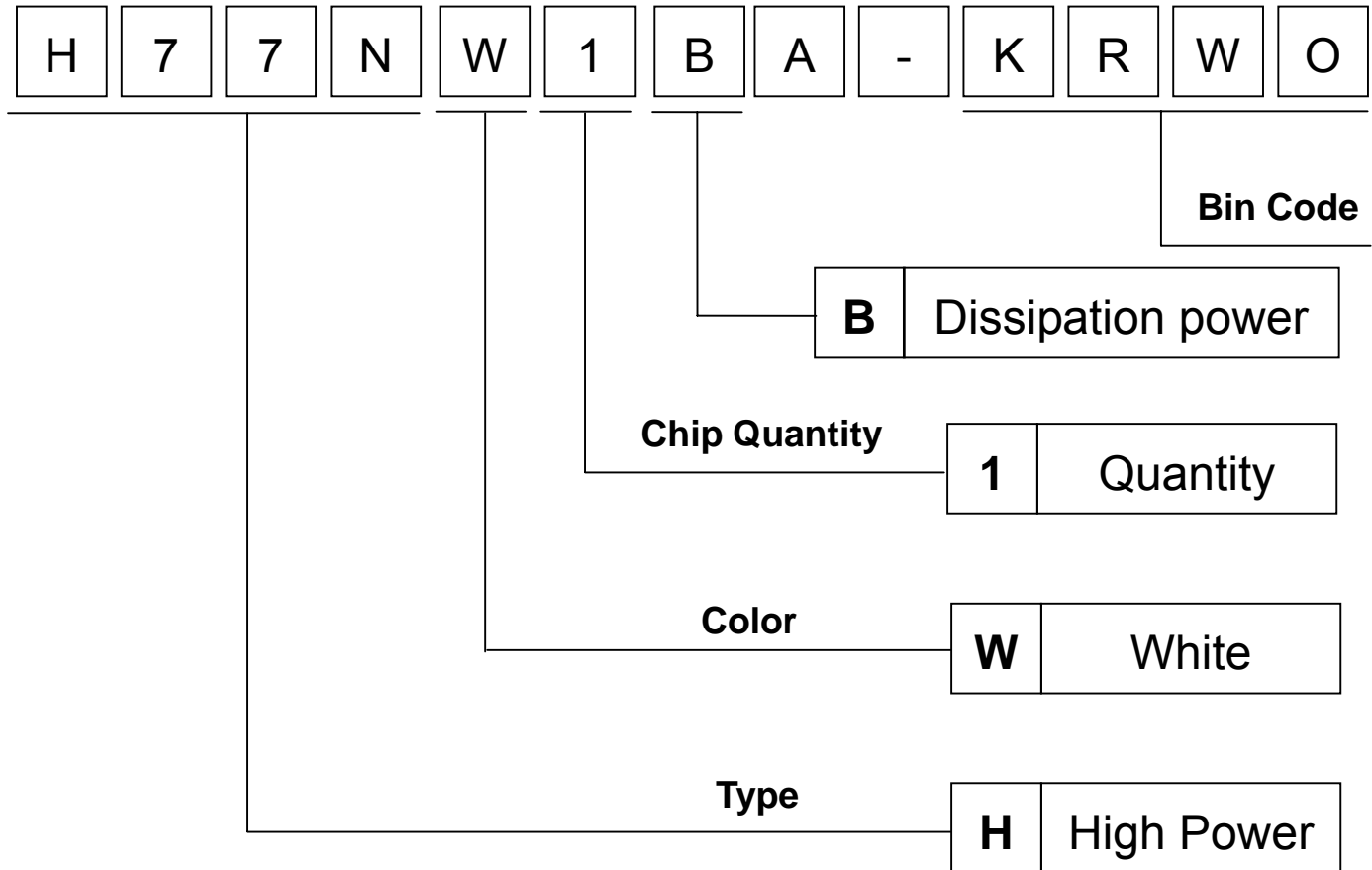
### Hue Bin Specification for Red, Green, Blue, Amber, Orange

Item	Bin Code	Symbol	Condition	Min.	Max.	Unit
Peak Wavelength	D2	$\lambda_p$	$I_F = 350 \text{ [mA]}$	450	455	nm
	D3			455	460	
Domain Wavelength	B1	$\lambda_d$		460	465	
	B2			465	470	
	G2			520	525	
	G3			525	530	
	G4			530	535	
	G5			535	540	
	A1			585	590	
	A2			590	595	
	R2			610	615	
	R3			615	620	
	R4			620	625	
	R5			625	630	



## 5. Part Number

### Formation



## 6. Characteristic Diagram

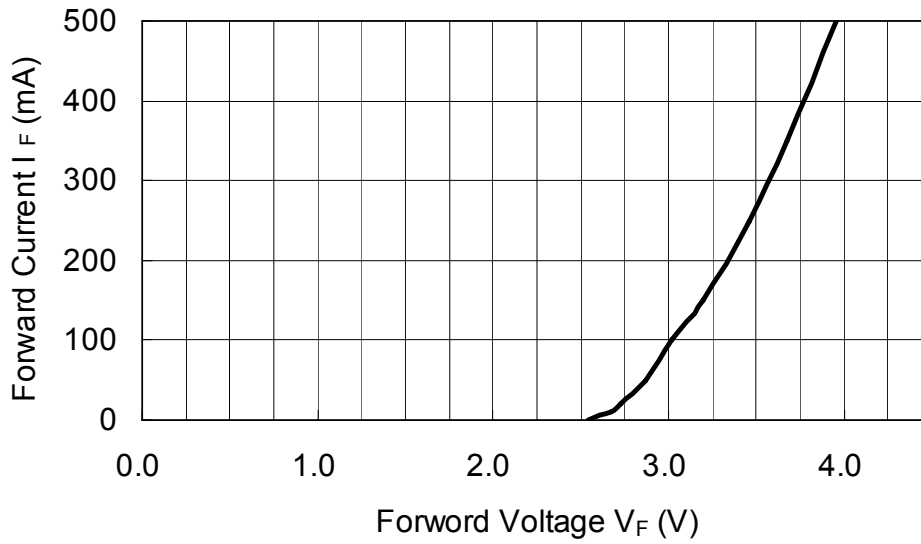


Fig. 1-A Forward Current vs. Forward Voltage: White/ Warm White/ Blue/ Green color

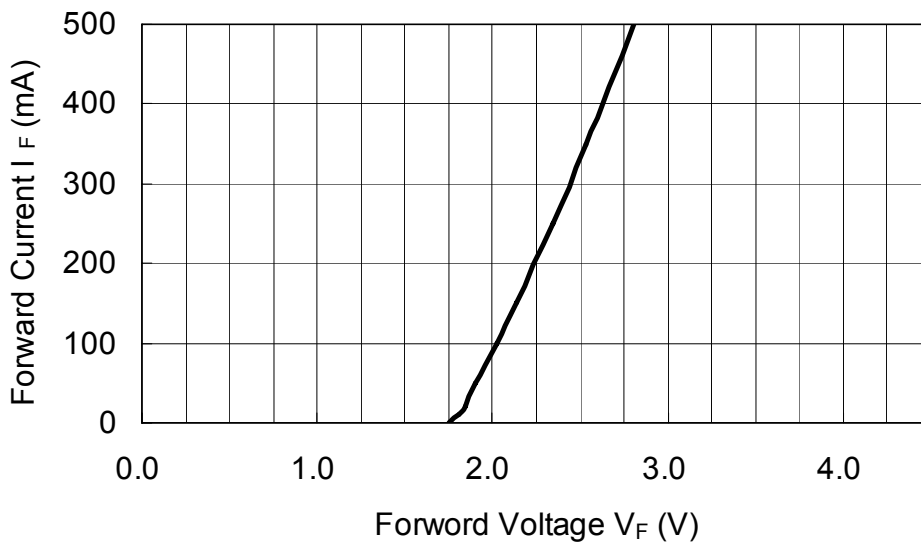
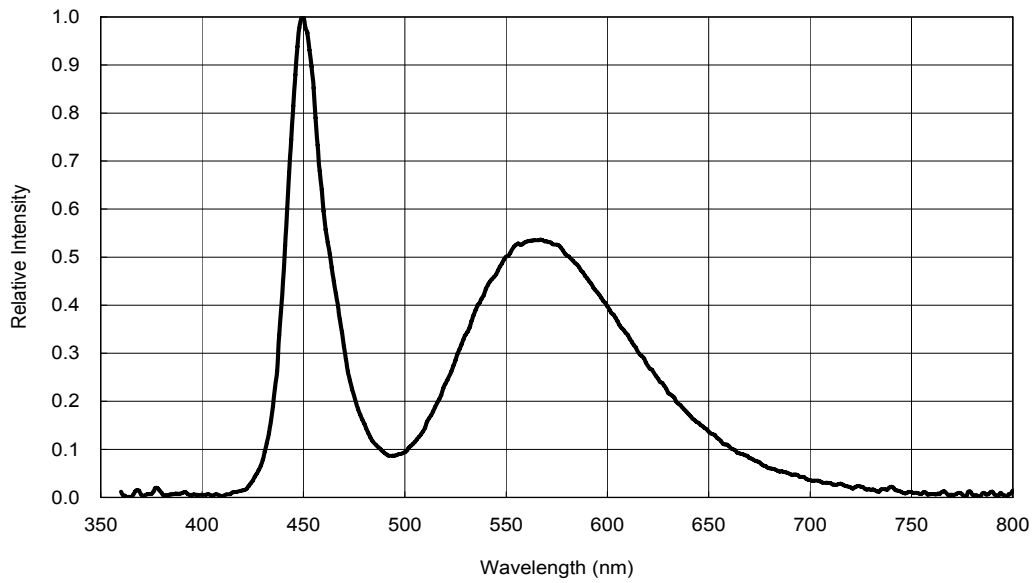
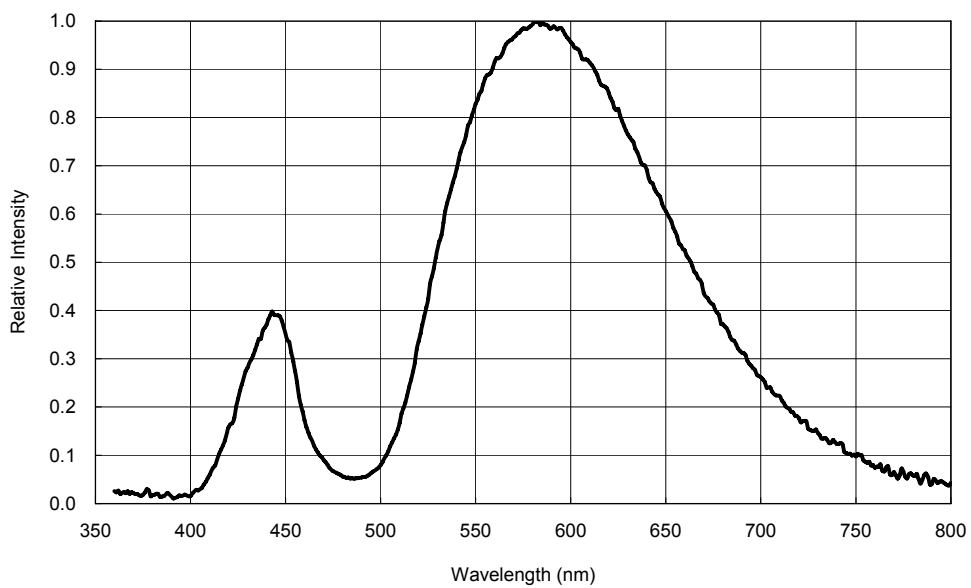


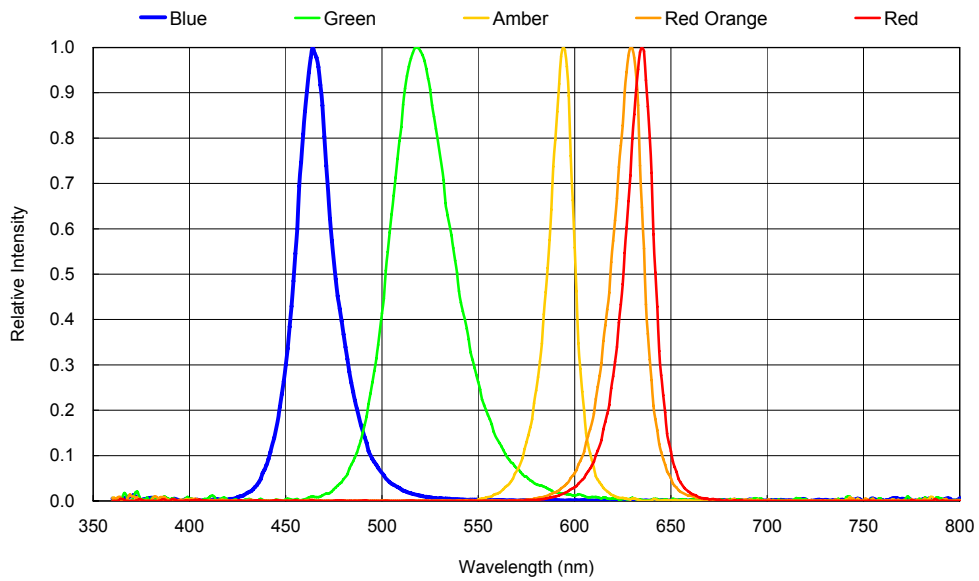
Fig. 1-B Forward Current vs. Forward Voltage: Red/Amber/Orange color



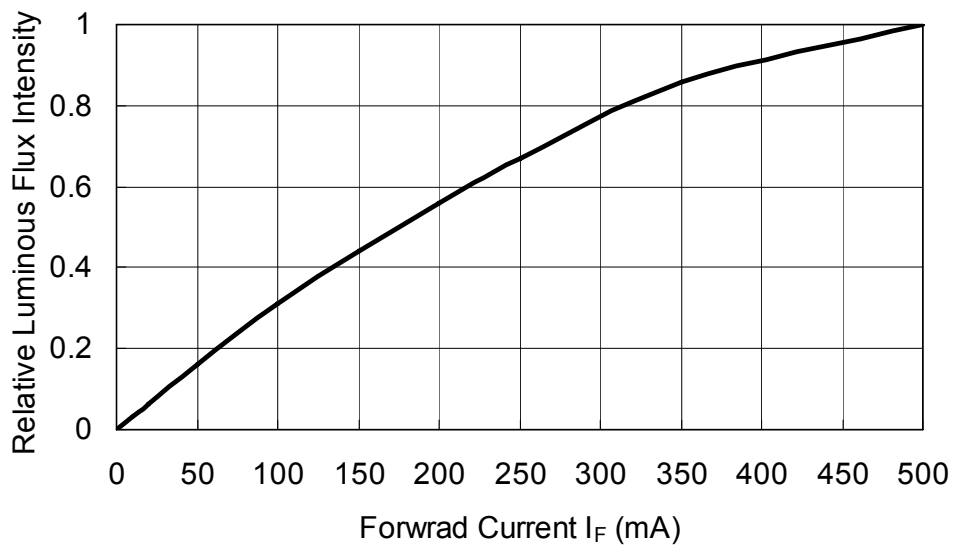
**Fig. 2-A Relative Intensity vs. Wavelength: White**



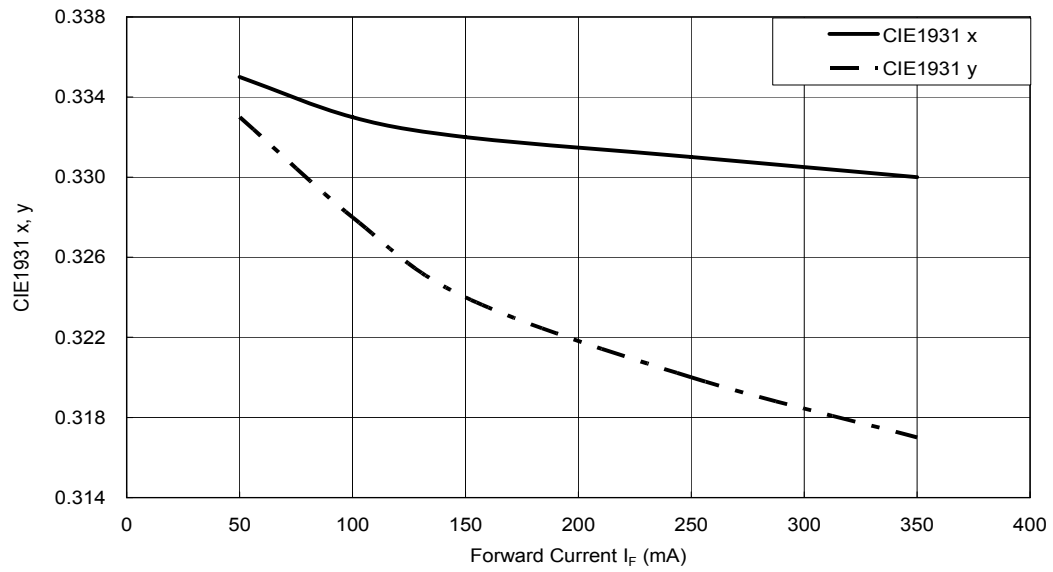
**Fig. 2-B Relative Intensity vs. Wavelength: Warm White**



**Fig. 2-C Relative Intensity vs. Wavelength: Single Color**

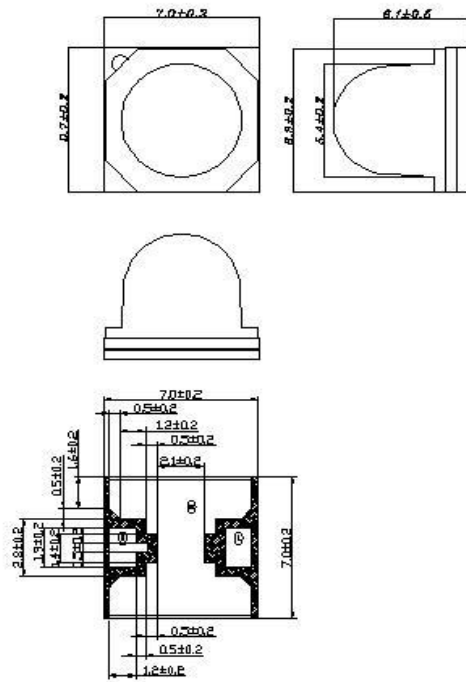


**Fig. 3 Relative Intensity VS Forward Current**

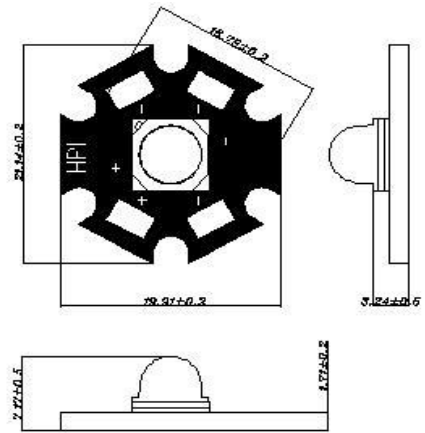


**Fig. 4 Forward Current VS CIE1931 x, y**



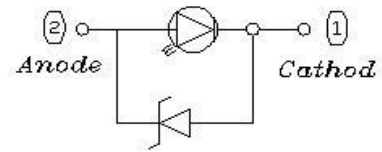


120° Lens Type

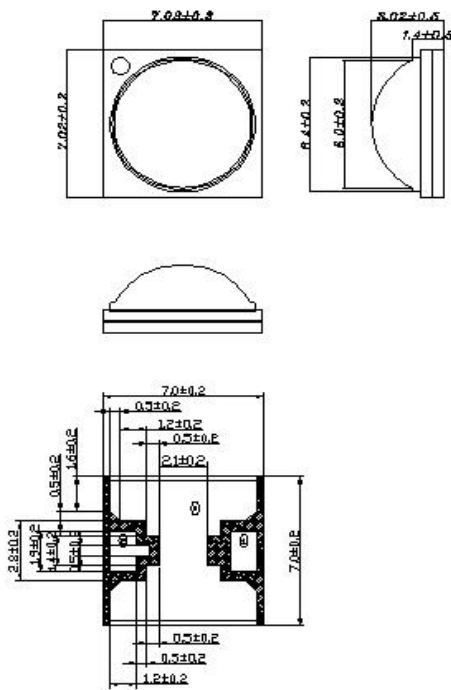


120° Lens Type with Star

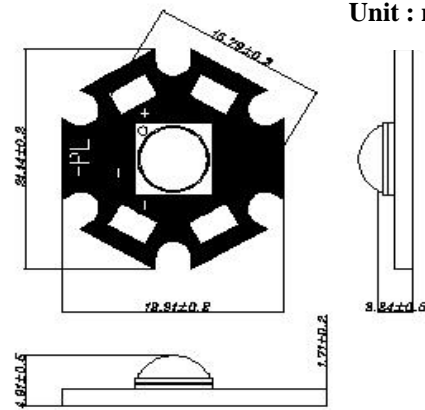
*Polarity*



Unit : mm

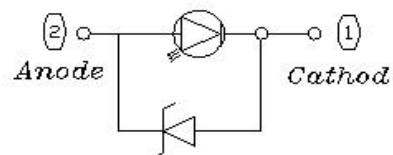


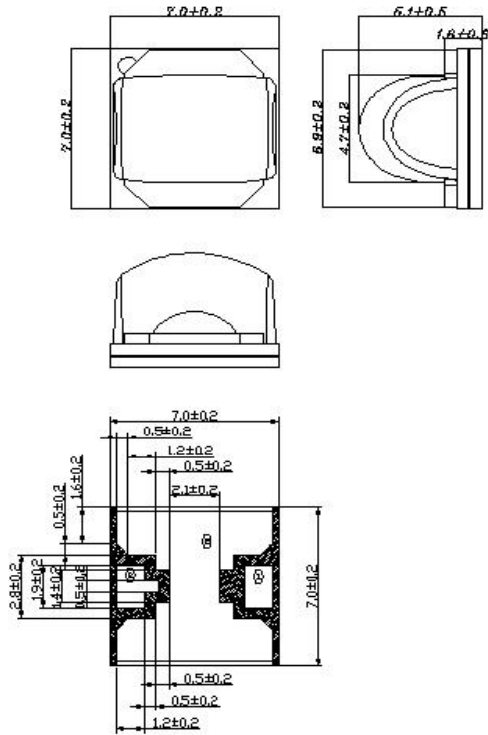
90°/30° Lens Type



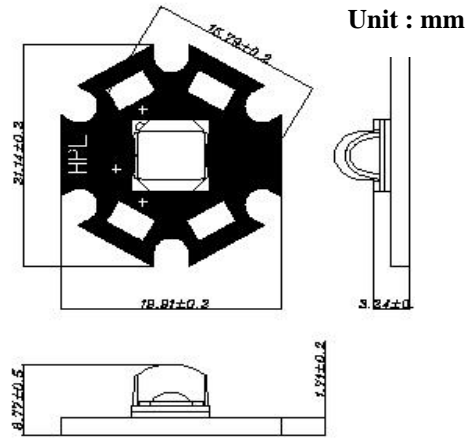
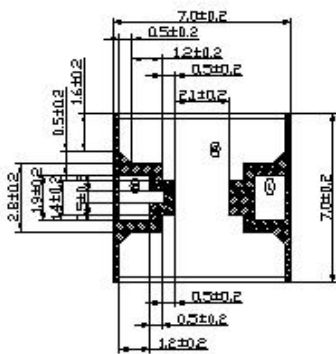
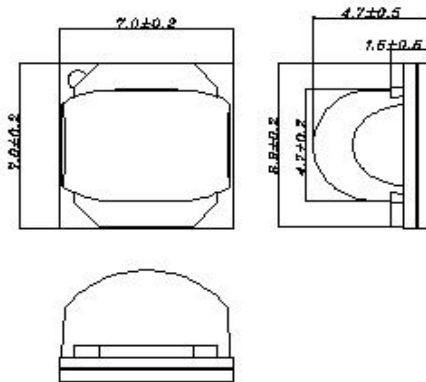
90°/30° Lens Type with Star

*Polarity*

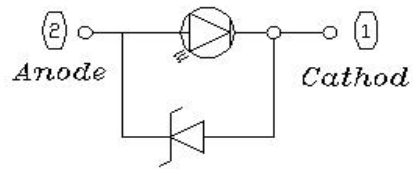




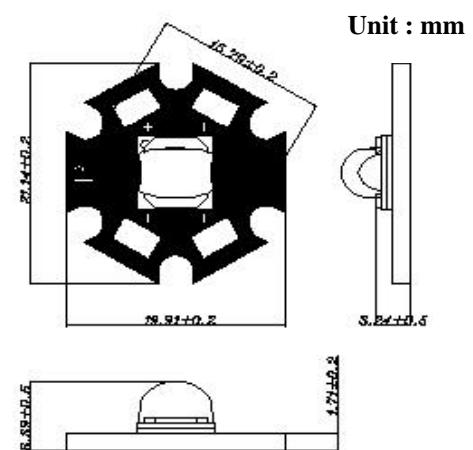
100°/50° Lens Type



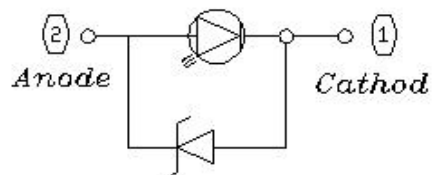
Polarity



100°/50° Lens Type with Star



Polarity



## 8. Shipping Package Style

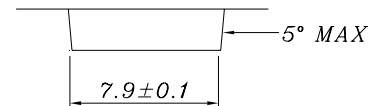
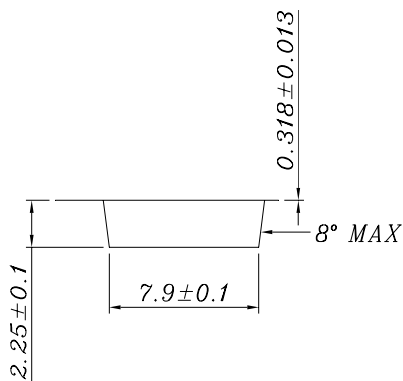
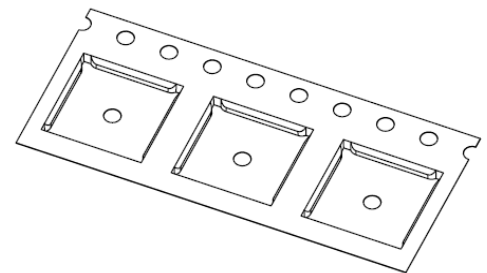
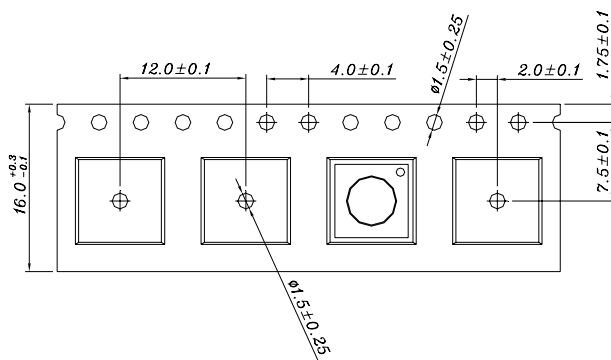


## (1) Tapping Dimension Packaging Specification

- Flat Type :

- Moisture proof bag.
- 1 Reel/bag.
- Q'ty: 500(MAX)/Reel.

Unit : mm

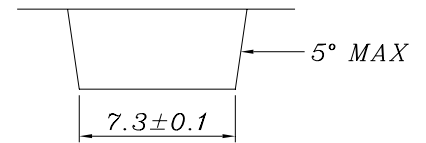
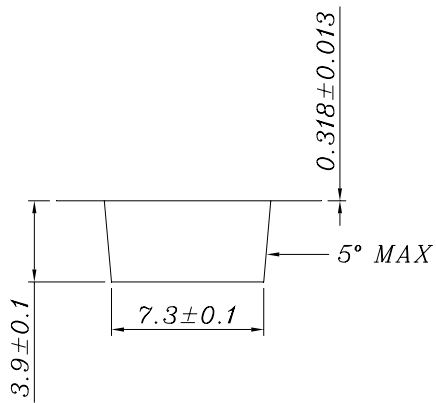
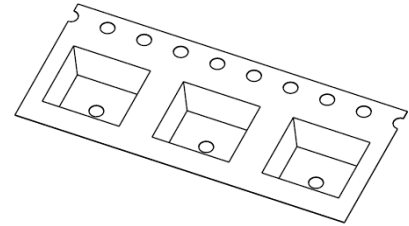
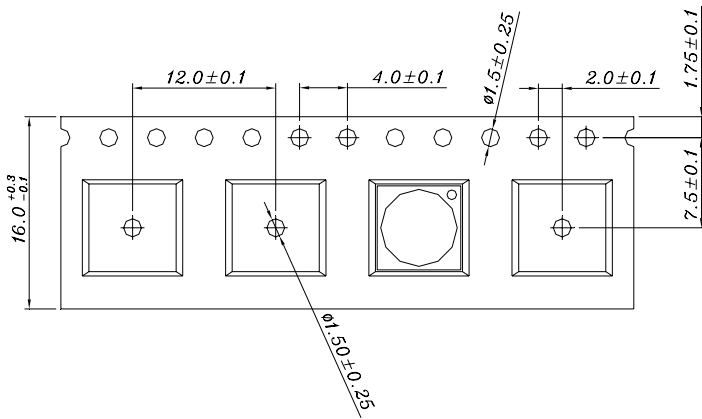


- With 120 degree Lens:

- Moisture proof bag.
- 1 Reel/bag.

- Q'ty: 180(MAX)/Reel.

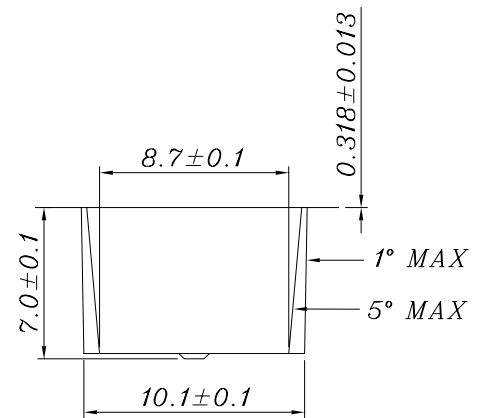
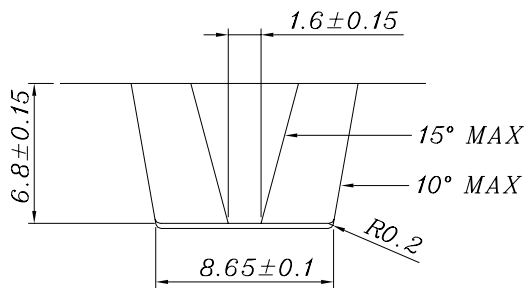
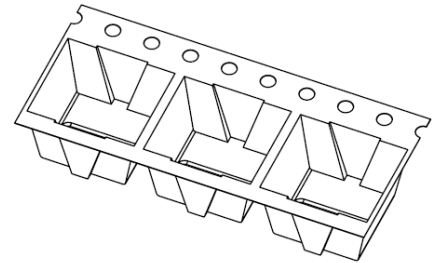
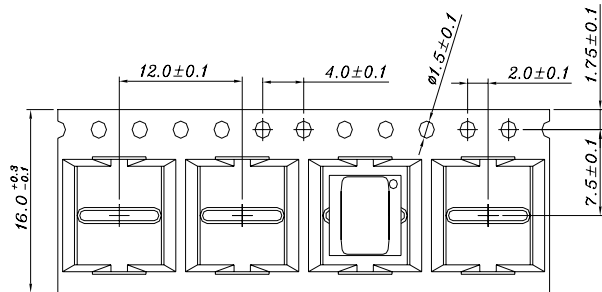
Unit : mm



● With 25, 45, 100/50, 90/30 degree Lens:

- Moisture proof bag.
- 1 Reel/bag.
- Q'ty: 100(MAX)/Reel.

Unit : mm



## (2) Package

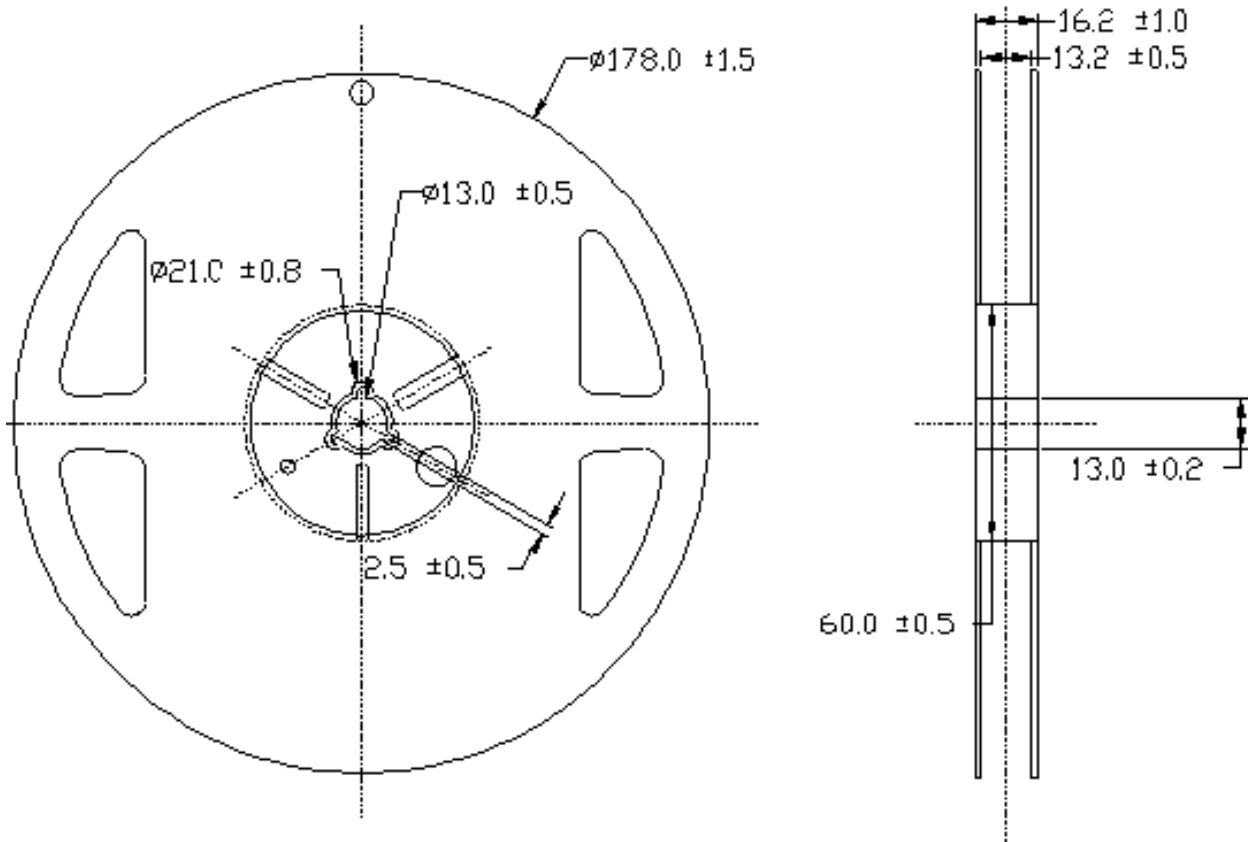
Box Type	Dimension (mm)	Reel/Box	Flat Type (Pcs)	120° Lens Type (Pcs)	Other Lens Type (Pcs)
Small Box(S)	230x85x265	4 Reel/Box	2000	720	400

<b>Middle Box(M)</b>	470x265x270	24 Reel/Box	12000	4320	2400
<b>Large Box(L)</b>	470x435x270	40 Reel/Box	20000	7200	4000

## Reel Packaging :

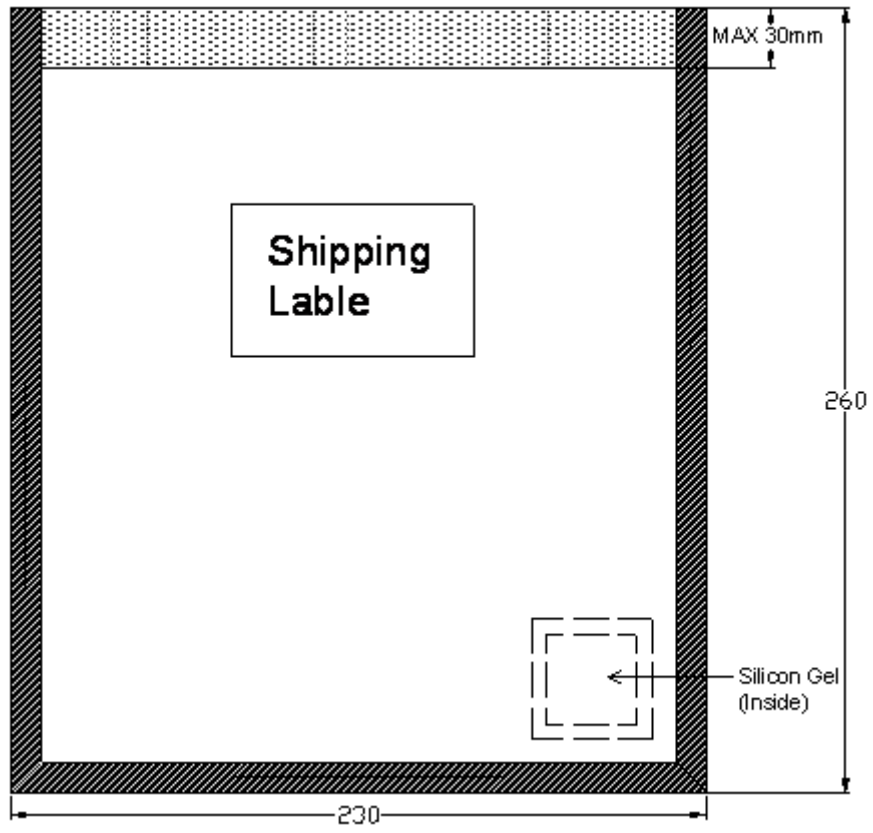
Reel Part :

Unit : mm



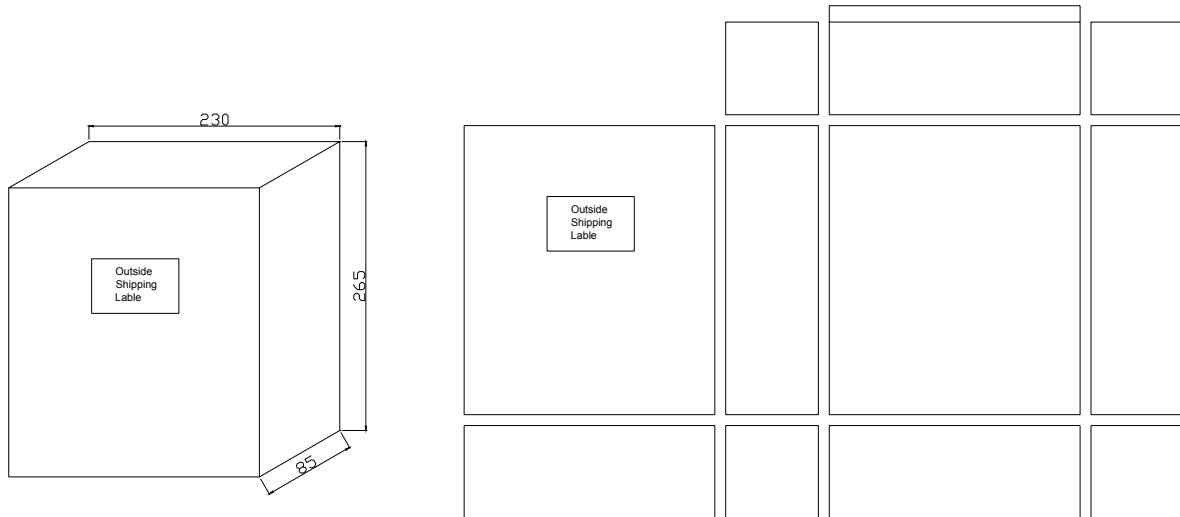
Anti Statistic Bag :

Unit : mm



**Small Box**

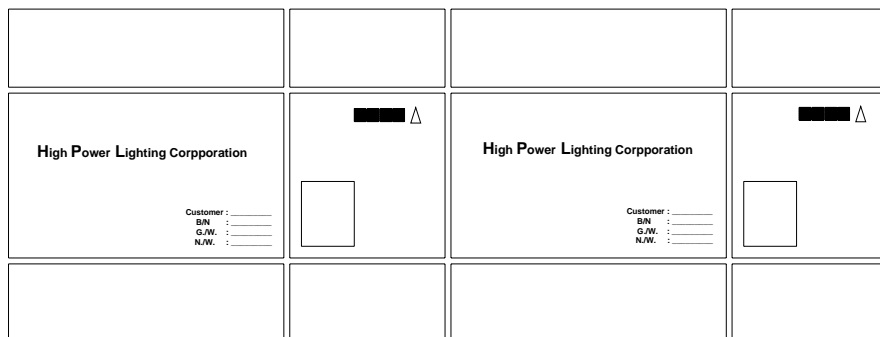
**Unit : mm**



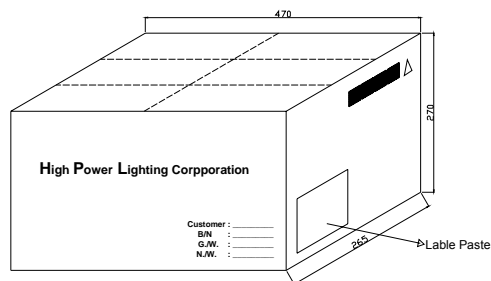
White Carton (Small Package)  
 230(L)mm x 85(T)mm x 265(H)mm  
 5 Reels inside per carton

## Middle Box

Unit : mm

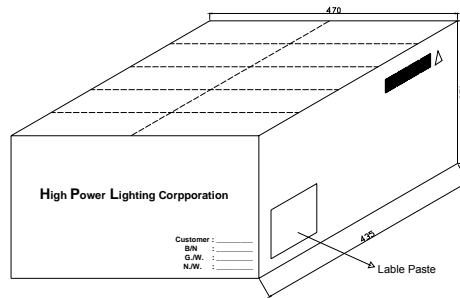
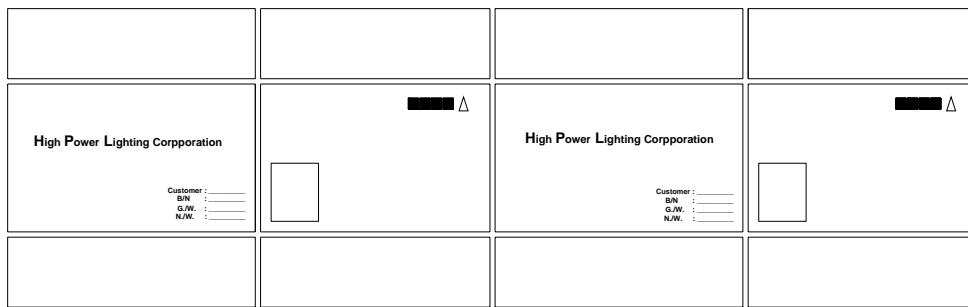


M size Carton (Middle Package)  
 470(L)mm x 265(T)mm x 270(H)mm  
 6 white box inside per M-carton  
 30 Reels inside per M-carton



## Large Box

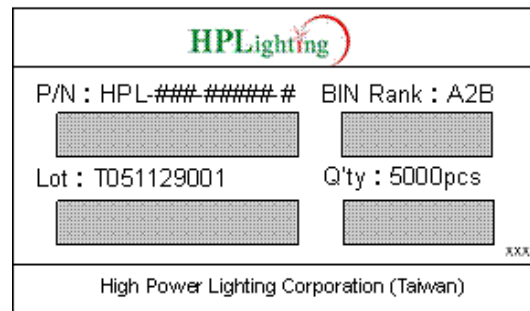
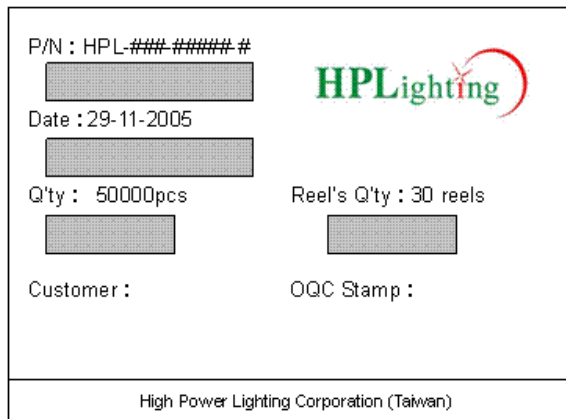
Unit : mm



L size Carton (Large Package)  
 470(L)mm x 435(T)mm x 270(H)mm  
 10 white box inside per L-carton  
 50 Reels inside per L-carton

### (3) Label Formation

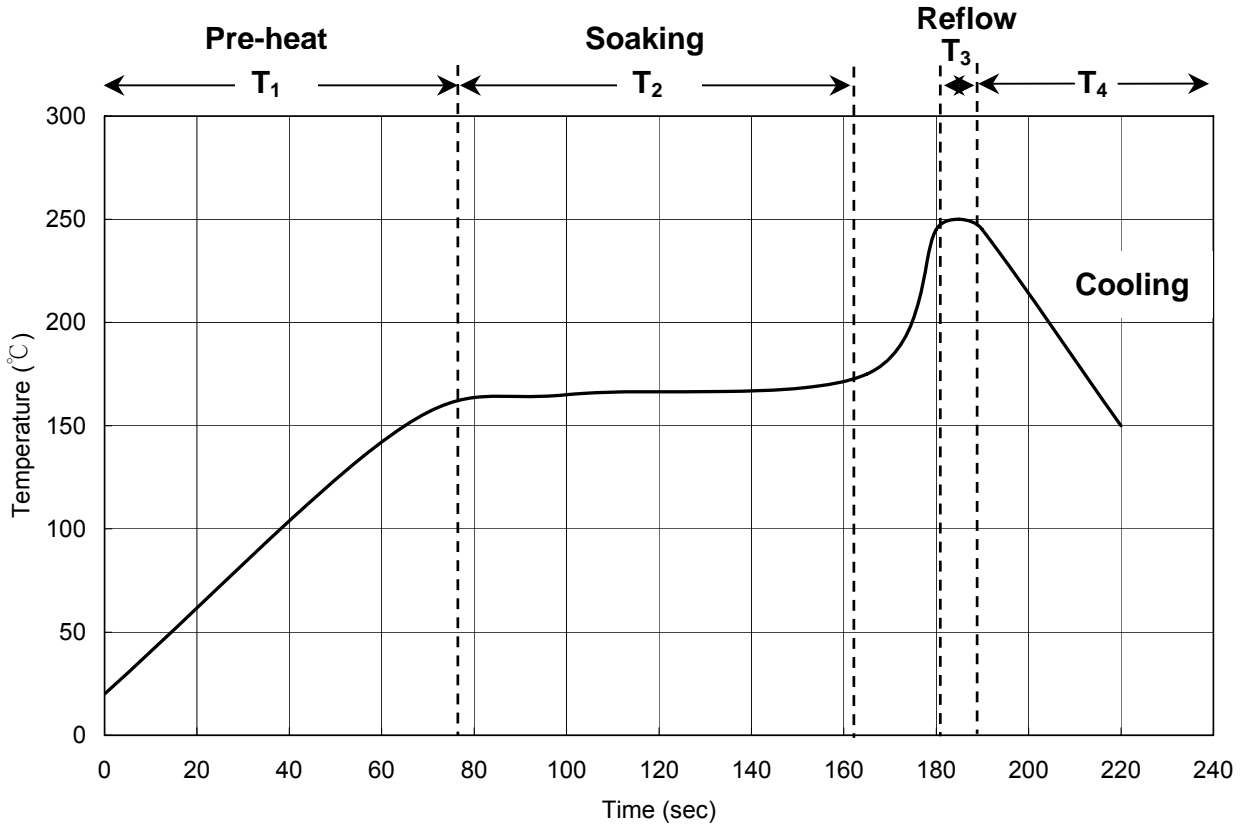
Unit : mm



## 9. Recommended Solder profile

## Soldering

Recommended soldering conditions:



T <sub>1</sub>	Ramp up rate	1.0 ~ 3.0 °C/sec
	Pre-heat time	50 ~ 80 sec
T <sub>2</sub>	Soaking temperature	155 ~ 185 °C
	Dwell time during soaking	60 ~ 120 sec
T <sub>3</sub>	Reflow temperature	240 ~ 250 °C
	Reflow time	Max 10 sec
	Ramp up rate during reflow	1.2 ~ 2.3 °C/sec
T <sub>4</sub>	Cooling	1.0 ~ 6.0 °C/sec

Note: Suggest using Sn96Ag3Cu0.5 lead free solder.

## Cleaning

Use alcohol-based cleaning solvents such as isopropyl alcohol to clean the LED if necessary.