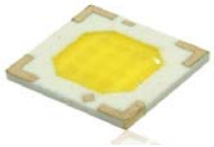
SEAM Semiconductors



SeamPower series can provide different power-operation and different colors. They serve as optical engine appropriately and can be applied to lighting and projector in the form of MR16 or others.

Features

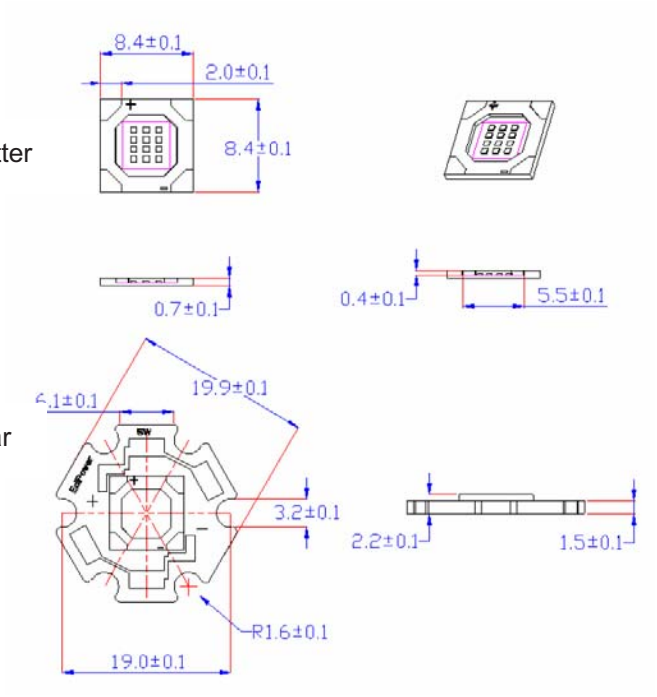
- LED lighting engine
- High power consumption
- Excellent thermal performance

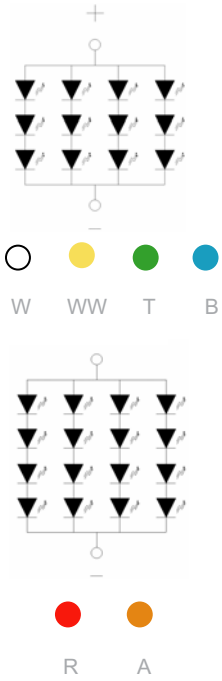
Typical Applications

- Reading lights
- Portable flashlight
- LEDs lighting engine
- Security / Garden lighting
- Indoor and Outdoor Commercial lighting
- LCD Backlights / Light guides
- Architectural lighting

Package Outlines: 5W

Emitter

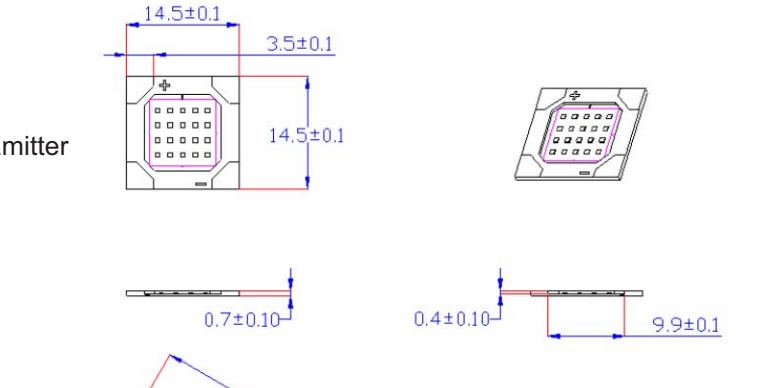


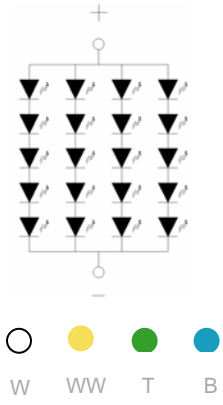


Unit: mm

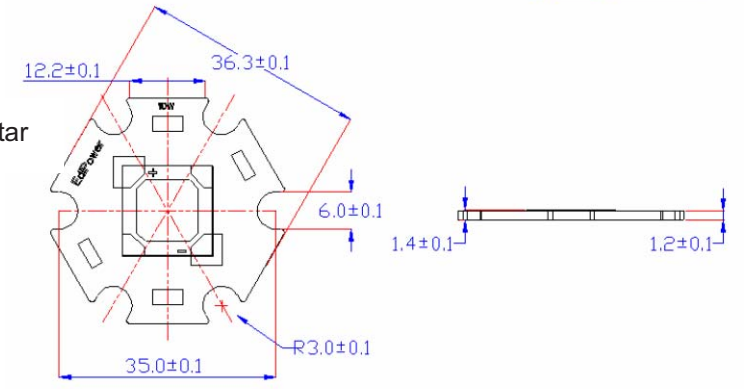
Package Outlines: 10W, 20W

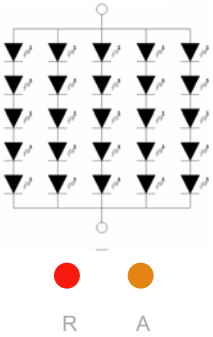
Emitter





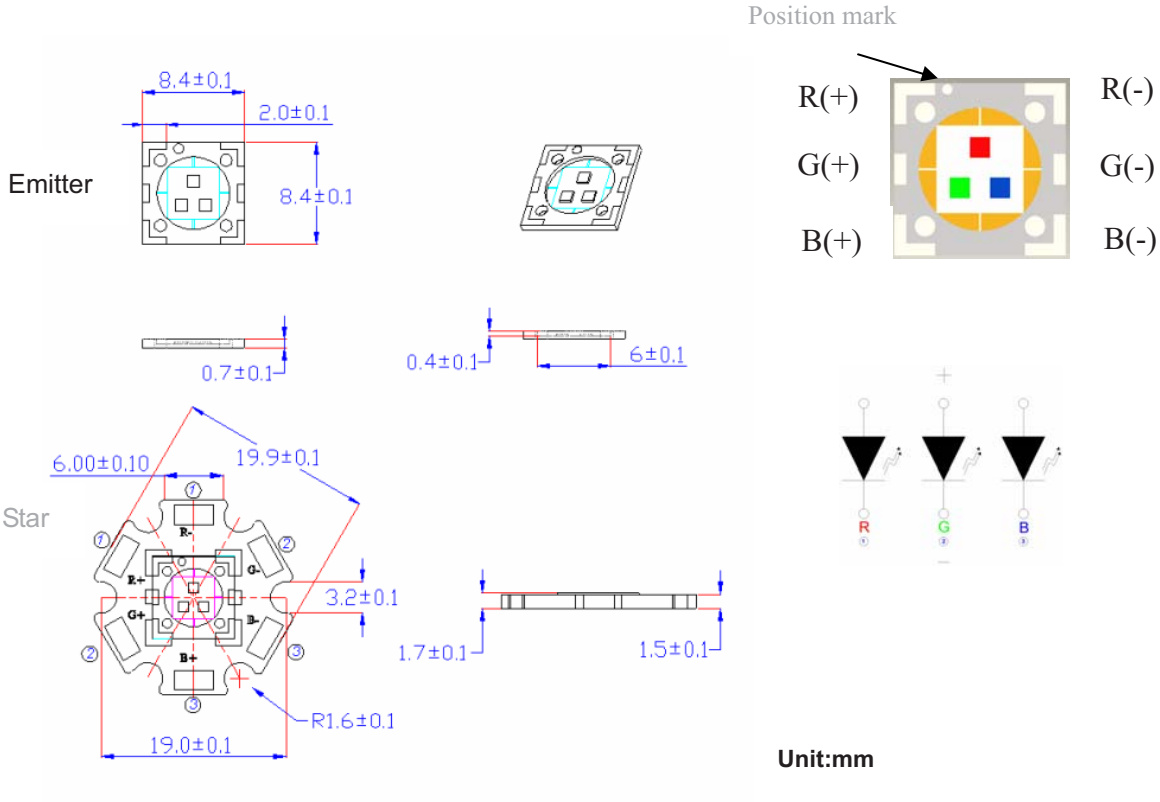
Star





Unit: mm

Package Outlines: RGB in one package



Absolute Maximum Ratings

Parameter	Symbol	Rating	Units/color
DC Forward Current	I_F	0.5 A (5W)	W, WW, B,G
		0.6 A (5W)	R, A
		0.645 A (10W)	W, WW, B,G
		0.96 A (10W)	R, A
		1.12 A (20W)	W, WW, B,G
		1.9 A (20W)	R, A
		0.35A(RGB)	R, G, B
Peak pulse current;(tp≦100μs, Duty cycle=0.005)	I_{pulse}	1 A (5W)	W, WW, B,G
		1.2 A (5W)	R, A
		1.29 A (10W)	W, WW, B,G
		1.92 A (10W)	R, A
		2.24 A (20W)	W, WW, B,G
		3.8 A (20W)	R, A
		0.5A(RGB)	R, G, B

Parameter	Symbol	Rating	Units/color
LED junction Temperature	**T_j**	**125**	℃
Operating Temperature	**T_{opr}**	**-30 ~ +110**	℃
Storage Temperature	**T_{stg}**	**-40 ~ +120**	℃
Manual Soldering Time at 400℃(Max.)	**T_{sol}**	**10 seconds**	3 times
LED Substrate Temperature	**T_s**	**<100**	℃
Reverse Voltage	**V_R**	**5**	V
Reverse Current(V_R=5V)	**I_R**	**50**	μA
ESD Sensitivity	**V_B**	**2,000**	V
Isolation Voltage	**Vi**	**50 (R,A)** **1,000 (W,WW,G,B)**	V
Thermal grease thickness	**Tt**	**0.1**	mm
Transient Surge Voltage	**TSv**	**28 (5W)** **32 (10W,20W)**	V

Luminous Flux and Electrical Characteristics

Power Consumption	Part Name	Color	Typ. Voltage (V)	Test Current (A)	Luminous Flux (lm)	Thermal Resistance To Case (℃/W)
5W	**SFNP5B-2E00**	Blue	***10.4***	***0.50***	***60***	***5***
	SFNP5T-2E00	True Green	***10.4***	***0.50***	***130***	***5***
	SFNP5A-2E00	Amber	***8.4***	***0.60***	***130***	***5***
	SFNP5R-2E00	Red	***8.4***	***0.60***	***130***	***5***
	SFNP5X-2E00	Warm White	***10.4***	***0.50***	***130***	***5***
	SFNP5W-2E00	White	***10.4***	***0.50***	***200***	***5***
Power Consumption	**Part Name**	**Color**	**Typ. Voltage (V)**	**Test Current (A)**	**Luminous Flux (lm)**	**Thermal Resistance To Case (℃/W)**
10W	**SFNP10B-2E00**	Blue	***17.5***	***0.645***	***120***	***2***
	SFNP10T-2E00	True Green	***17.5***	***0.645***	***250***	***2***
	SFNP10A-2E00	Amber	***10.5***	***0.960***	***250***	***2***
	SFNP10R-2E00	Red	***10.5***	***0.960***	***250***	***2***
	SFNP10X-2E00	Warm White	***17.5***	***0.645***	***250***	***2***
	SFNP10W-2E00	White	***17.5***	***0.645***	***400***	***2***

Power Consumption	Part Name	Color	Typ. Voltage (V)	Test Current (A)	Luminous Flux (lm)	Thermal Resistance To Case (℃/W)
	SFNP20B-4E00	Blue	***17.8***	***1.12***	***240***	***2***
	SFNP20T-4E00	True Green	***17.8***	***1.12***	***500***	***2***
20W	**SFNP20A-4E00**	Amber	***10.5***	***1.90***	***500***	***2***
	SFNP20R-4E00	Red	***10.5***	***1.90***	***500***	***2***
	SFNP20X-4E00	Warm White	***17.8***	***1.12***	***450***	***2***
	SFNP20W-4E00	White	***17.8***	***1.12***	***700***	***2***

JEDEC Moisture Sensitivity:

Level	Floor Life		Soak Requirements			
			Standard		Accelerated Environment	
	Time	Conditions	Time (hours)	Conditions	Time (hours)	Conditions
2a	**4 weeks**	**≦30℃ / 60% RH**	**696 +5/-0**	**30℃ / 60% RH**	**120 +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.**

Chip Characteristics for single color

Color	Dominant Wavelength (λd)nm	Forward Voltage (V)
Red	620～630	1.90～2.35
Amber	585～595	1.90～2.35
True Green	520～530	3.20～3.65
Blue	465～475	3.20～3.65

Chip Characteristics for RGB in one(EP3M-4XXX，40 mil chip size)

Color	Dominant Wavelength (λd)nm	Forward Voltage (V)	Test current (A)	Luminous Flux (lm)
Red	625～630	1.9～2.2	0.35	15
True Green	520～525	3.2～3.5	0.35	35
Blue	455～460	3.4～3.7	0.35	12

Electrical Characteristics

Power Consumption	Part Name	Color	Min. Voltage (V)	Typ. Voltage (V)	Max. Voltage (V)
5W	SFNP5B-2E00	Blue	*9.3*	*10.2*	*11.4*
	SFNP5T-2E00	True Green	*9.3*	*10.2*	*11.4*
	SFNP5A-2E00	Amber	*8.0*	*9.2*	*10.8*
	SFNP5R-2E00	Red	*8.0*	*9.2*	*10.8*
	SFNP5X-2E00	Warm White	*9.3*	*10.2*	*11.4*
	SFNP5W-2E00	White	*9.3*	*10.2*	*11.4*

Power Consumption	Part Name	Color	Min. Voltage (V)	Typ. Voltage (V)	Max. Voltage (V)
10W	SFNP10B-2E00	Blue	*16.6*	*17.2*	*18.3*
	SFNP10T-2E00	True Green	*16.6*	*17.2*	*18.3*
	SFNP10A-2E00	Amber	*11.0*	*12.1*	*13.0*
	SFNP10R-2E00	Red	*11.0*	*12.1*	*13.0*
	SFNP10X-2E00	Warm White	*16.6*	*17.2*	*18.3*
	SFNP10W-2E00	White	*16.6*	*17.2*	*18.3*

Power Consumption	Part Name	Color	Min. Voltage (V)	Typ. Voltage (V)	Max. Voltage (V)
20W	SFNP20B-4E00	Blue	*16.6*	*17.8*	*18.3*
	SFNP20T-4E00	True Green	*16.6*	*17.8*	*18.3*
	SFNP20A-4E00	Amber	*11.0*	*12.1*	*13.0*
	SFNP20R-4E00	Red	*11.0*	*12.1*	*13.0*
	SFNP20X-4E00	Warm White	*16.6*	*17.8*	*18.3*
	SFNP20W-4E00	White	*16.6*	*17.8*	*18.3*

Voltage bin

Power Consumption	Part Name	Color	Bin Group		Bin Group	
5W	SFNP5B-2E00	Blue	*VB01*	9.3～10.1	*VB02*	*10.2*～10.8
	SFNP5T-2E00	True Green	*VT01*	9.3～10.1	*VT02*	*10.2*～10.8
	SFNP5A-2E00	Amber	*VA01*	8.0～9.1	*VA02*	*9.2*～10.8
	SFNP5R-2E00	Red	*VR01*	8.0～9.1	*VR02*	*9.2*～10.8
	SFNP5X-2E00	Warm White	*VX01*	9.3～10.1	*VX02*	*10.2*～10.8
	SFNP5W-2E00	White	*VW01*	9.3～10.1	*VW02*	*10.2*～10.8
Power Consumption	Part Name	Color	Bin Group		Bin Group	
10W	SFNP10B-2E00	Blue	*VB01*	16.6～17.1	*VB02*	*17.2*～18.3
	SFNP10T-2E00	True Green	*VT01*	*16.*6～17.1	*VT02*	*17.2*～18.3
	SFNP10A-2E00	Amber	*VA01*	*11.0*～12.0	*VA02*	*12.1*～13.0
	SFNP10R-2E00	Red	*VR01*	*11.*0～12.0	*VR02*	*12.1*～13.0
	SFNP10X-2E00	Warm White	*VX01*	*16.*6～17.1	*VX02*	*17.2*～18.3
	SFNP10W-2E00	White	*VW01*	*16.*6～17.1	*VW02*	*17.2*～18.3
Power Consumption	Part Name	Color	Bin Group		Bin Group	
20W	SFNP20B-4E00	Blue	*VB01*	16.6～17.1	*VB02*	*17.2*～18.3
	SFNP20T-4E00	True Green	*VT01*	*16.*6～17.1	*VT02*	*17.2*～18.3
	SFNP20A-4E00	Amber	*VA01*	*11.0~12.0*	*VA02*	*12.1~13.0*
	SFNP20R-4E00	Red	*VR01*	*11.*0～12.0	*VR02*	*12.1*～13.0
	SFNP20X-4E00	Warm White	*VX01*	*16.*6～17.1	*VX02*	*17.2*～18.3
	SFNP20W-4E00	White	*VW01*	*16.*6～17.1	*VW02*	*17.2*～18.3

CCT ranks

CCT Group	CCT (°K)
Warm White	**2,700 ~ 3,300**
X1	2,700 ~ 2,900
X2	2,900 ~ 3,100
X3	3,100 ~ 3,300
White	**5,200 ~ 7,200**
W1	5,200 ~ 5,600
W2	5,600 ~ 6,000
W3	6,000 ~ 6,400
W4	6,400 ~ 6,800
W5	6,800 ~ 7,200

Part No.Spec.

Power Consumption	Part Name	Color	Chip Connection	Note
5W	SFNP5B-2E00	Blue	*3 series 4 parallel*	*Only emitter*
	SFNP5T-2E00	True Green	*3 series 4 parallel*	*Only emitter*
	SFNP5A-2E00	Amber	*4 series 4 parallel*	*Only emitter*
	SFNP5R-2E00	Red	*4 series 4 parallel*	*Only emitter*
	SFNP5X-2E00	Warm White	*3 series 4 parallel*	*Only emitter*
	SFNP5W-2E00	White	*3 series 4 parallel*	*Only emitter*
Power Consumption	**Part Name**	**Color**	**Chip Connection**	**Note**
10W	SFNP10B-2E00	Blue	*5 series 4 paralle*	*Only emitter*
	SFNP10T-2E00	True Green	*5 series 4 parallel*	*Only emitter*
	SFNP10A-2E00	Amber	*5 series 5 parallel*	*Only emitter*
	SFNP10R-2E00	Red	*5 series 5 parallel*	*Only emitter*
	SFNP10X-2E00	Warm White	*5 series 4 parallel*	*Only emitter*
	SFNP10W-2E00	White	*5 series 4 parallel*	*Only emitter*

Power Consumption	Part Name	Color	Chip Connection	Note
20W	SFNP20B-4E00	Blue	*5 series 4 parallel*	*Only emitter*
	SFNP20T-4E00	True Green	*5 series 4 parallel*	*Only emitter*
	SFNP20A-4E00	Amber	*5 series 5 parallel*	*Only emitter*
	SFNP20R-4E00	Red	*5 series 5 parallel*	*Only emitter*
	SFNP20X-4E00	Warm White	*5 series 4 parallel*	*Only emitter*
	SFNP20W-4E00	White	*5 series 4 parallel*	*Only emitter*

Power Consumption	Part Name	Color	Chip Connection	Note
5W	SFNP5B-2S00	Blue	*3 series 4 parallel*	*With Aluminum PCB*
	SFNP5T-2S00	True Green	*3 series 4 parallel*	*With Aluminum PCB*
	SFNP5A-2S00	Amber	*4 series 4 parallel*	*With Aluminum PCB*
	SFNP5R-2S00	Red	*4 series 4 parallel*	*With Aluminum PCB*
	SFNP5X-2S00	Warm White	*3 series 4 parallel*	*With Aluminum PCB*
	SFNP5W-2S00	White	*3 series 4 parallel*	*With Aluminum PCB*

Power Consumption	Part Name	Color	Chip Connection	Note
10W	SFNP10B-2S00	Blue	*5 series 4 parallel*	*With Aluminum PCB*
	SFNP10T-2S00	True Green	*5 series 4 parallel*	*With Aluminum PCB*
	SFNP10A-2S00	Amber	*5 series 5 parallel*	*With Aluminum PCB*
	SFNP10R-2S00	Red	*5 series 5 parallel*	*With Aluminum PCB*
	SFNP10X-2S00	Warm White	*5 series 4 parallel*	*With Aluminum PCB*
	SFNP10W-2S00	White	*5 series 4 parallel*	*With Aluminum PCB*

Power Consumption	Part Name	Color	Chip Connection	Note
20W	SFNP20B-4S00	Blue	*5 series 4 paralle*	*With Aluminum PCB*
	SFNP20T-4S00	True Green	*5 series 4 parallel*	*With Aluminum PCB*
	SFNP20A-4S00	Amber	*5 series 5 parallel*	*With Aluminum PCB*
	SFNP20R-4S00	Red	*5 series 5 parallel*	*With Aluminum PCB*
	SFNP20X-4S00	Warm White	*5 series 4 parallel*	*With Aluminum PCB*
	SFNP20W-4S00	White	*5 series 4 parallel*	*With Aluminum PCB*

SeamPower Reliability

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

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

Life means the time light output decay 30% (L_{70}%)

Tj (oC)	Life (hours)	Tj (oC)	Life (hours)	Tj (oC)	Life (hours)
25	234,000	65	54,000	110	15,100
30	191,000	70	46,000	115	13,300
35	157,000	75	39,600	120	11,700
40	129,000	80	34,000	125	10,500
45	107,000	85	29,500	130	9,300
50	90,000	90	25,700	135	8,300
55	75,000	100	19,500	140	7,500
60	64,000	105	17,100	150	6,000

ASSIST FORM about High Power LED Reliability (5W SeamPower White, Warm White, Blue, Green) Ts=ceramic substrate temperature

	Ts=45°C	Ts=65°C	Ts=85°C
Voltage	10.2V	10.2V	10.2V
Current	500mA	500mA	500mA
Wattage	5.1W	5.1W	5.1W
Heat	5.0W	5.0W	5.0W
Rth	5.0 °C/W	5.0 °C/W	5.0 °C/W
Tj	70 °C	90 °C	110 °C
$L_{70\%}$	46,000hrs	25,700hrs	15,100hrs

ASSIST FORM about High Power LED Reliability(10W SeamPower White, Warm White, Blue, Green)

	Ts=45°C	Ts=65°C	Ts=85°C
Voltage	17.2V	17.2V	17.2V
Current	600mA	600mA	600mA
Wattage	10.32W	10.32W	10.32W
Heat	10.0W	10.0W	10.0W
Rth	2.0 °C/W	2.0 °C/W	2.0 °C/W
Tj	65 °C	85 °C	105 °C
$L_{70\%}$	54,000hrs	29,500hrs	19,500hrs

ASSIST FORM about High Power LED Reliability(20W SeamPower White, Warm White, Blue, Green)

	Ts=45°C	Ts=65°C	Ts=85°C
Voltage	17.8V	17.8V	17.8V
Current	1120mA	1120mA	1120mA
Wattage	20.0W	20.0W	20.0W
Heat	20.0W	20.0W	20.0W
Rth	2.0 °C/W	2.0 °C/W	2.0 °C/W
Tj	85 °C	105 °C	125 °C
$L_{70\%}$	29,500hrs	19,500hrs	10,500hrs

How to Know Tj in Your Application?

a. junction to case

Rth=5 °C/W for 5W between junction to case

△T=5x5=25 °C

Rth=4 °C/W for 10W and 20W between junction to case

For 10W device △T=3x10=30 °C

For 20W device △T=3x20=60 °C

b. case to board

The thermal grease is 200um.

K(MCPCB)=1.4 W/mk for 5W between case to board

Then Rth(case-board)= $\frac{200}{1.4x(8.4x8.4)}$ =2.0

For 5W device △T=2x5=10 °C

K(MCPCB)=1.4 W/mk for 10W and 20W between case to board

Then Rth(case-board)= $\frac{200}{1.4x(14.5x14.5)}$ =0.7

For 10W device △T=0.7x10=7 °C

For 20W device △T=0.7x20=14 °C

c. board to air

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

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

For 5W

If heat sink area is 100cm^2 Rth=5.0

If heat sink area is 150cm^2 Rth=3.3

For 10W and 20W

If heat sink area is 300cm^2 Rth=1.7

If heat sink area is 600cm^2 Rth=0.8

d. ΔT totally

For 5W

If heat sink area is 100cm^2 Rth=5.0 ΔT=25+10+5x5=60 °C

If heat sink area is 150cm^2 Rth=3.3 ΔT=25+10+3.3x5=51.5 °C

For 10W

If heat sink area is 300cm^2 Rth=1.7 ΔT=20+7+1.7x10=44 °C

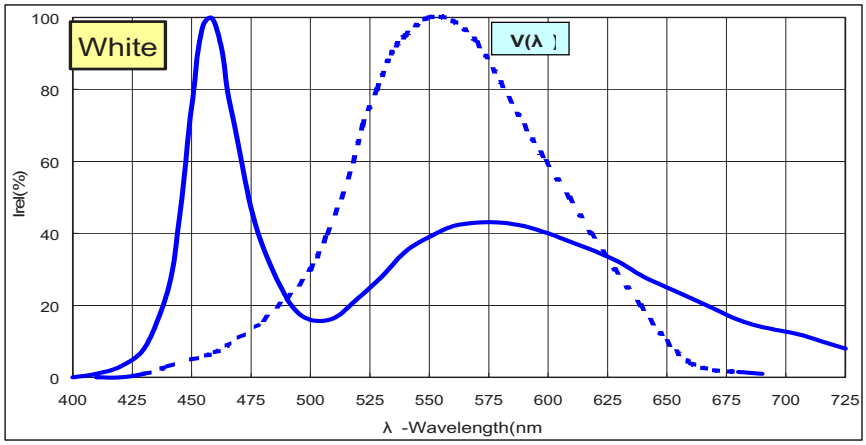
If heat sink area is 600cm^2 Rth=0.8 ΔT=20+7+0.8x10=35 °C

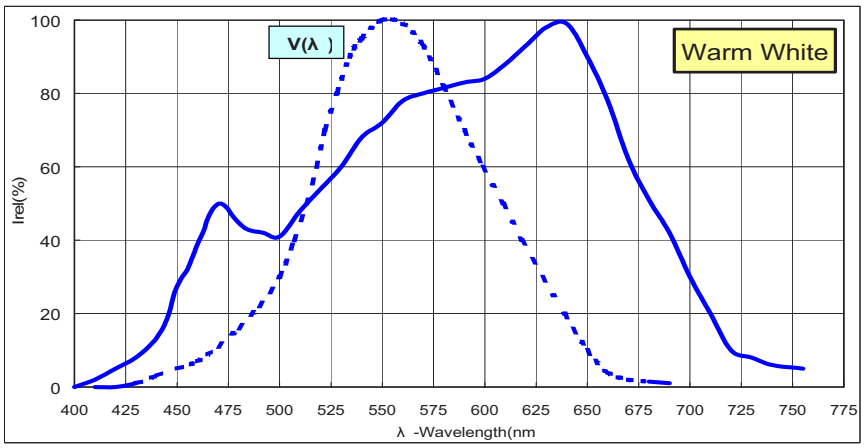
For 20W

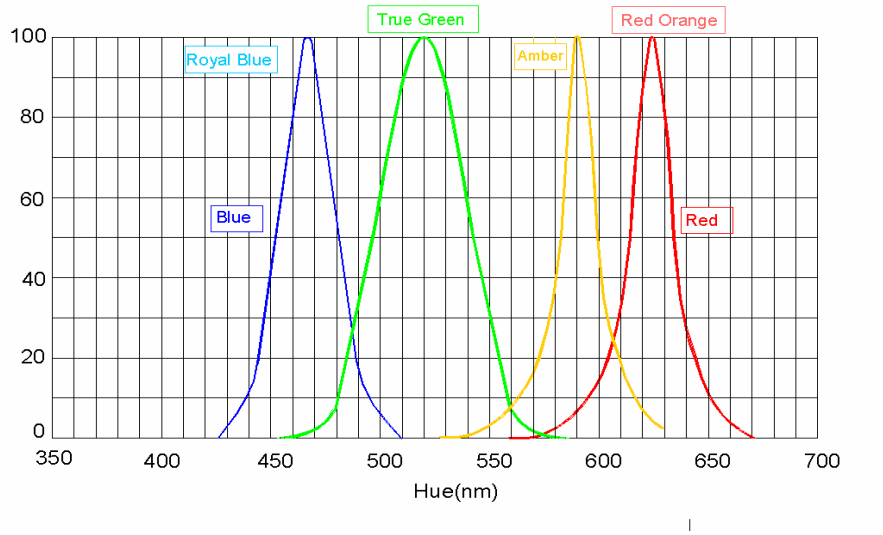
If heat sink area is 300cm^2 Rth=1.7 ΔT=40+14+1.7x20=88°C

If heat sink area is 600cm^2 Rth=0.8 ΔT=40+14+0.8x20=70 °C

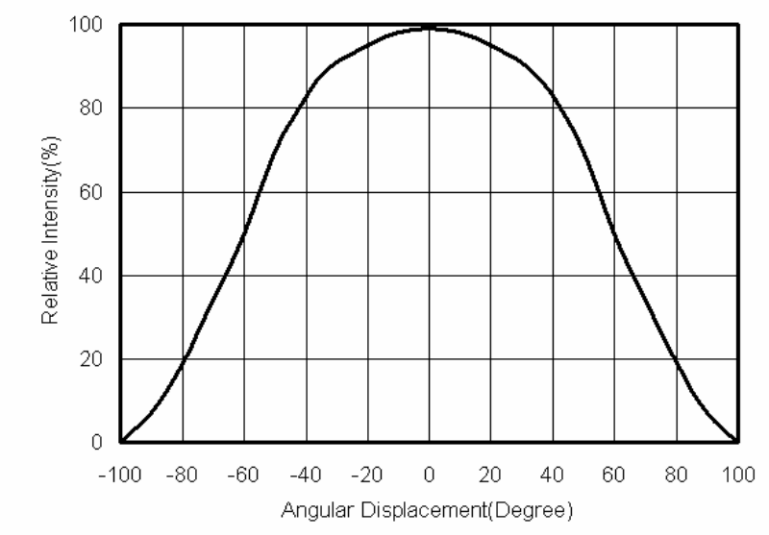
Electrical & Optical Curves-Spectrum



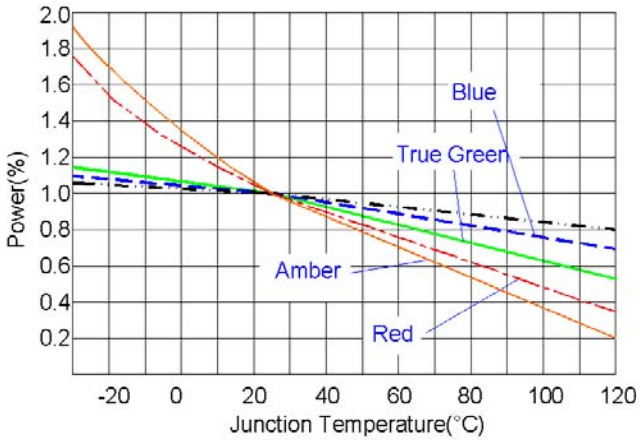




Typical Radiation Pattern (5W, 10W, 20W, White, Warm White, Blue, Green, Amber and Red)



Luminous Flux v.s. Junction Temperature



Package dimensions

Tray

Dimension: 12x18 cm (5W)

15x21 cm (10W)

Antistatic bag

Dimension: 19.5x29 cm

10 trays inside for 5W

5 trays inside for 10,20W

Package

Dimension: 24x17x9.5 cm

2 antistatic bags inside

(250 pcs for 5W)

(125 pcs for 10W and 20W)

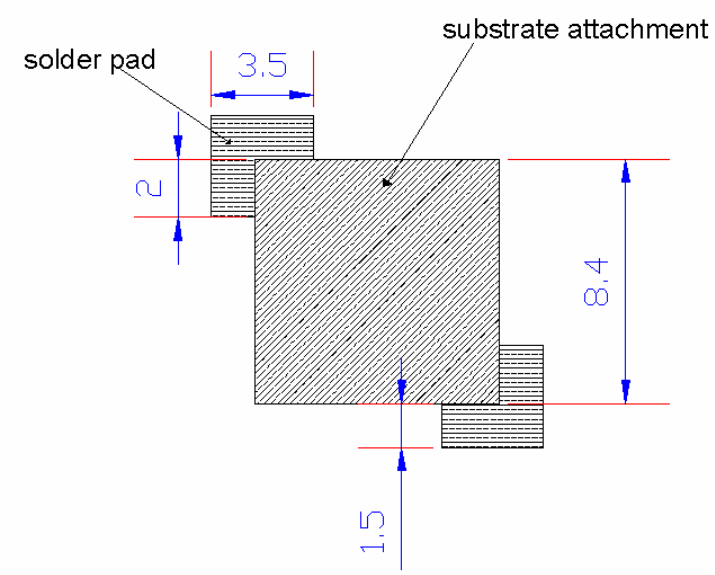
Power Consumption	Emitter(g)	Tray(g)	Antistatic bag(g)	Package(g)
5W	0.15	25	290	658
10W, 20W	0.45	65	366	810

Note: Package storage condition will be limited in temperature 20~30℃, RH 40~50%

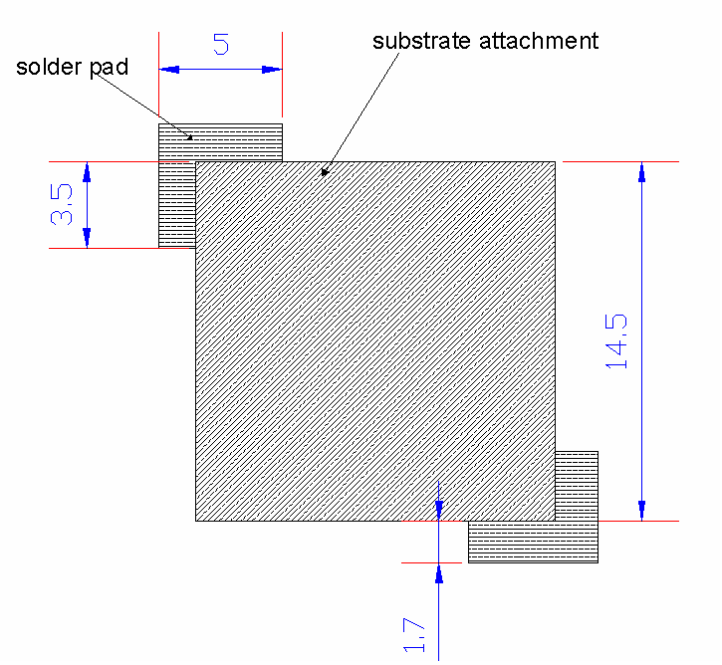
Manual Soldering: It is strongly recommended that solder tip temperature is limited under 400℃ 10 seconds 3 times. Damage to the silicone layer can cause emitter failure.

Aluminum PCB Design:

5W



10W, 20W



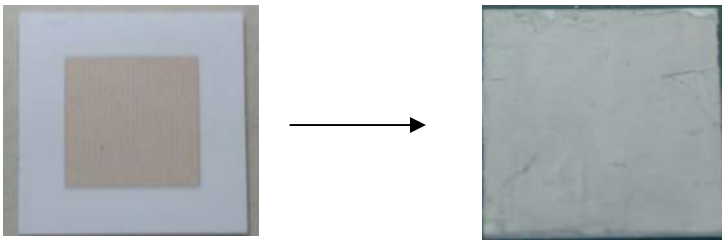
Unit : mm

Thermal Grease Application:

Company: YONYU APPLIED TECHNOLOGY MATERIAL (http://www.yatm.com.tw)

Grease Name: TG-6800-1 (K=2.6 W/mK)

Step1: Spread grease on the rear surface of emitter



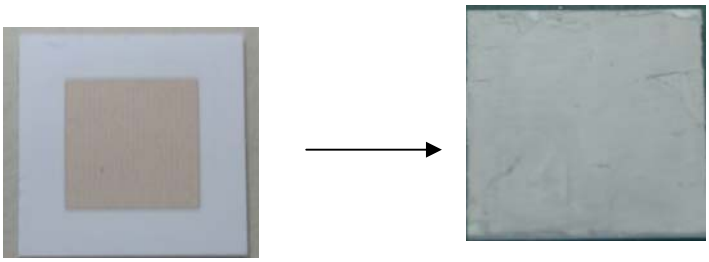
Rear surface Grease on rear surface

Step2: Fix emitter on heat sink or Aluminum PCB.

Company: SHINETSU (http://www.shinetsu.co.jp)

Grease Name: KJR-9086-1 (K=2.3 W/mK)

Step1: Spread grease on the rear surface of emitter



Rear surface Grease on rear surface

Step2: Fix emitter on heat sink or Aluminum PCB.

Step3: Put emitter and heat sink or Aluminum PCB in oven 150℃ 20 minutes

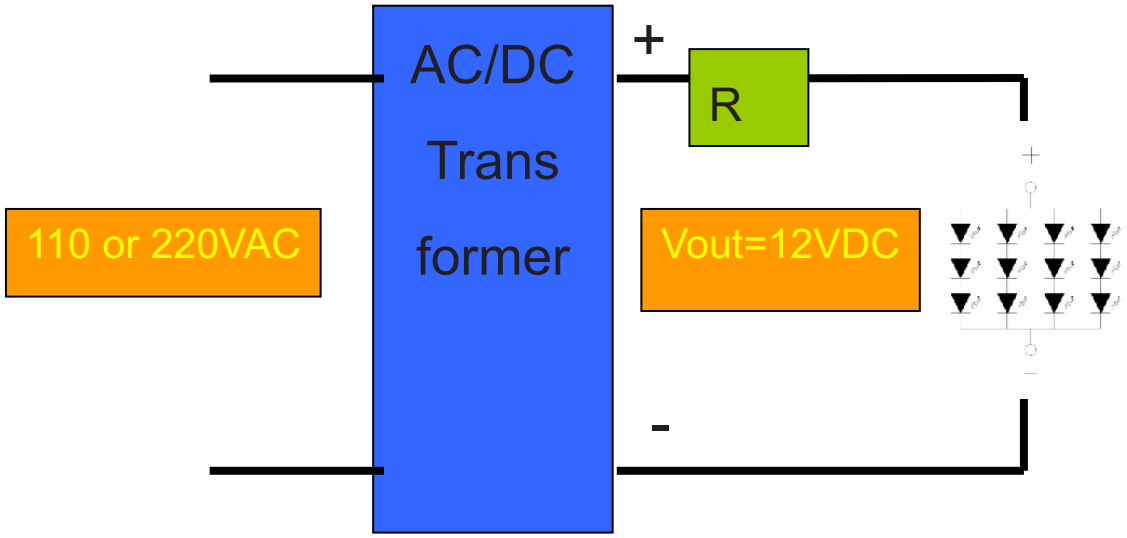
Handling Precausions:

1. Please do not use tweezer to touch the surface of silicone (emitting area).
2. Please do not press or touch the surface of silicone (emitting area).
3. Please wear anti-static wrist or glove to prevent ESD damage when assembling.
4. Please do not let SeamPower emitter fall down or press the surface of ceramic

Simple Test Method

Actually, constant current circuit is strongly suggested. The constant voltage circuit as below is not a good method to use though it is simple. Heat dissipation must be cared even testing pulse is short, otherwise some interface will be damaged.

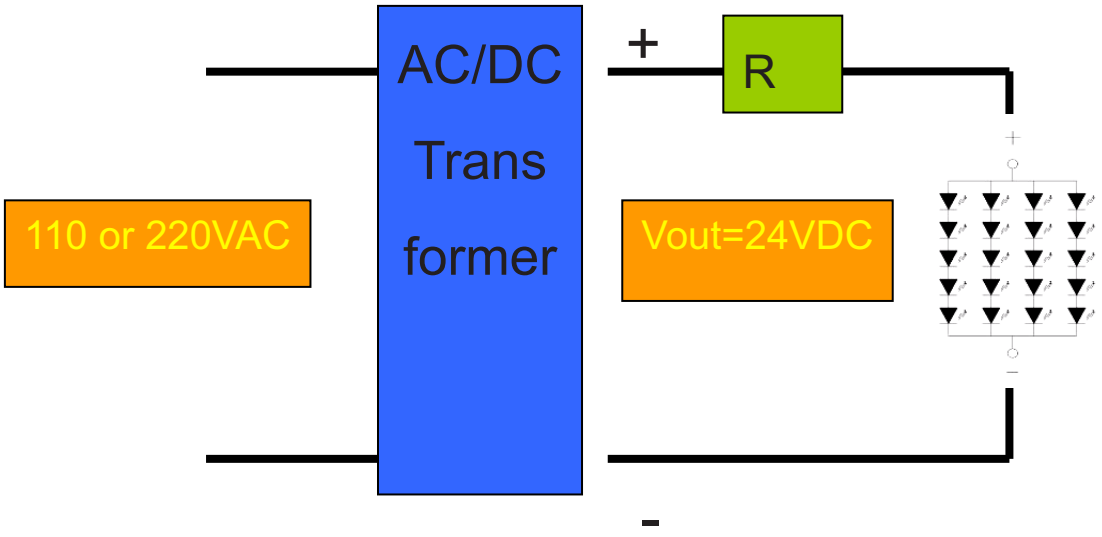
5W



R=4Ω for white, warm white, Green and Blue

R=6Ω for red and Amber

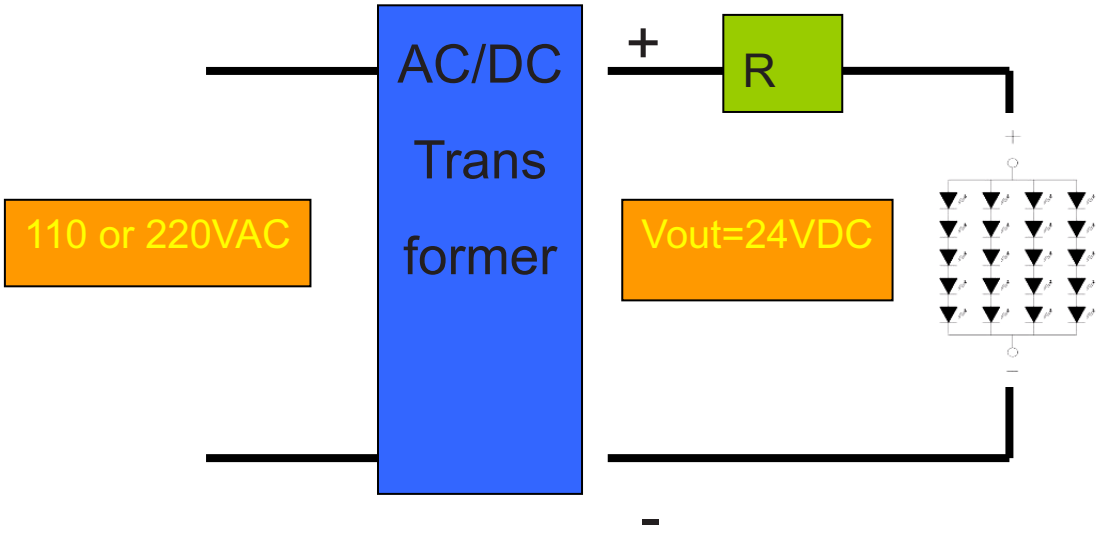
10W



R=10Ω for White, Warm White, Green, Blue

R=2Ω for Red and Amber

20W



R=5Ω for White and Warm

Revised History

Rev.	Issue Date	Revised Item	Note
1.1	2006/02/06	Form changed	
1.2	2006/03/27	1. Add thermal resistance 2. Add thermal grease application 3. Add simple test method	P. 4 P. 10 P. 11
1.3	2006/07/07	1. Add white and warm white CCT group 2. Add JEDEC data 3. Add Tj information 4. Add assist recommends information 5. Add Rth calculation	P. 7 P. 5 P. 10 P. 11 P. 12