

Ultra High Power LED

EdiPower™ Emitter

Approved By Customer	Designer	Checker	Approval

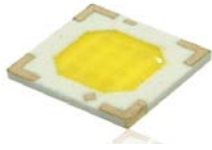
Date : 2006/7/7

Version : 1.3

Device No. : 3-RD-01-H0001
EDISON OPTO CORPORATION
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EdiPowerTM



EdiPower 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

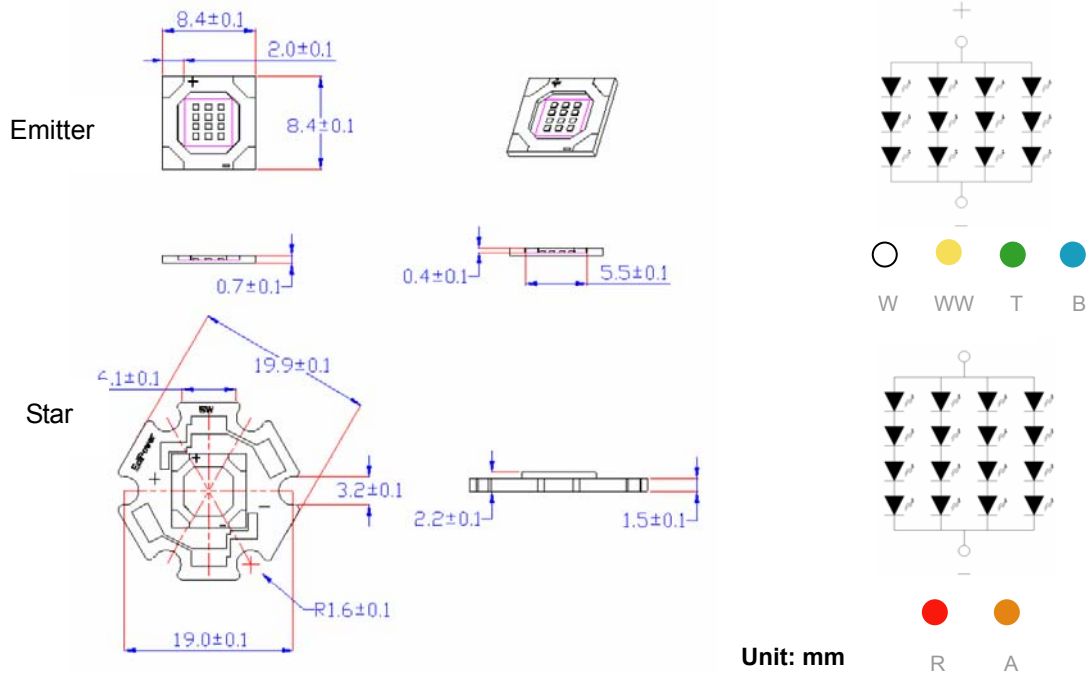
- LED lighting engine
- High power consumption
- Excellent thermal performance

Typical Applications

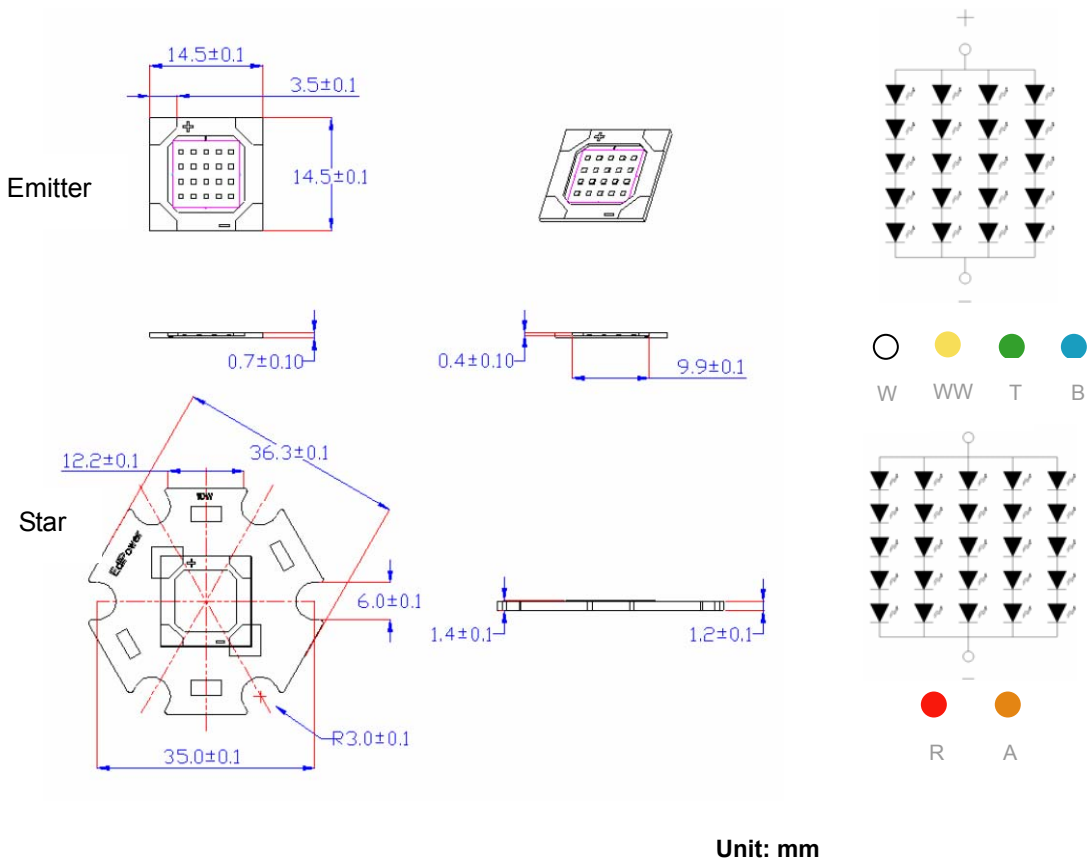
- Reading lights
- Portable flashlight
- LEDs lighting engine
- Security / Garden lighting
- Indoor and Outdoor Commercial lighting
- LCD Backlights / Light guides
- Architectural lighting



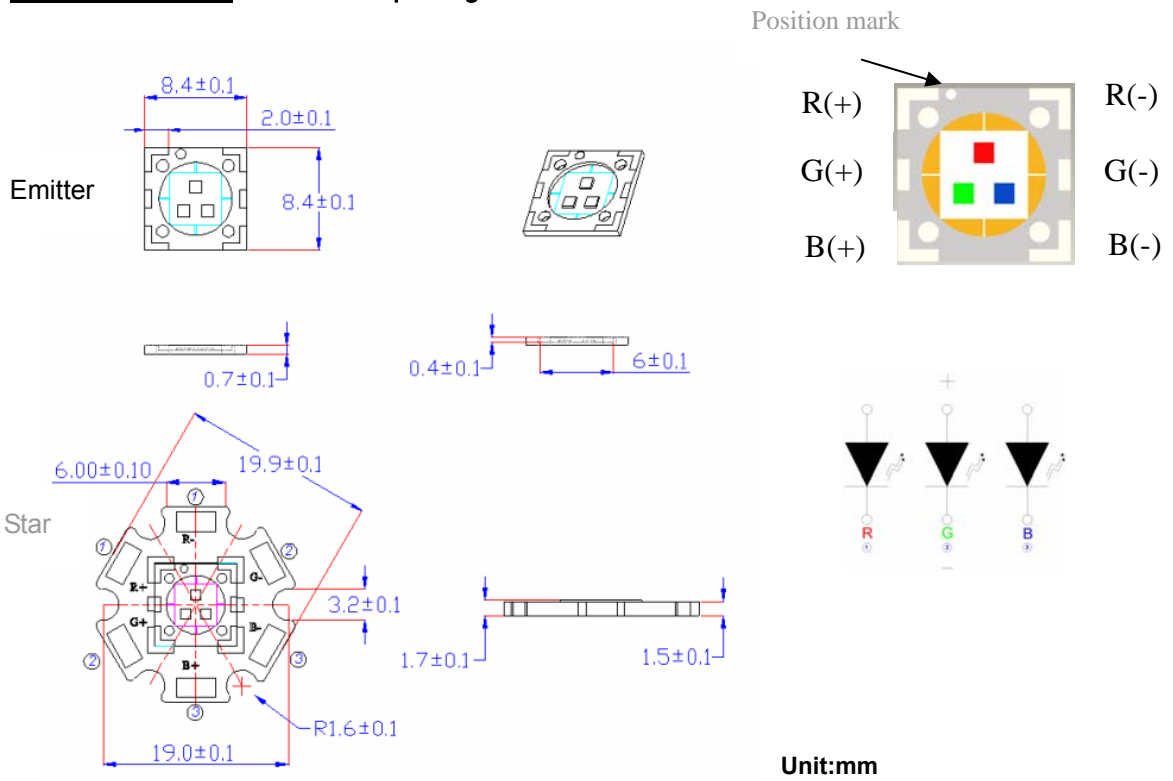
Package Outlines: 5W



Package Outlines: 10W, 20W



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	°C
Operating Temperature	T _{opr}	-30 ~ +110	°C
Storage Temperature	T _{stg}	-40 ~ +120	°C
Manual Soldering Time at 400°C(Max.)	T _{sol}	10 seconds	3 times
LED Substrate Temperature	T _s	<100	°C
Reverse Voltage	V _R	5	V
Reverse Current(V _R =5V)	I _R	50	μA
ESD Sensitivity	V _B	2,000	V
Isolation Voltage	V _i	50 (R,A) 1,000 (W,WW,G,B)	V
Thermal grease thickness	T _t	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 (°C/W)
5W	EP5W-2E00	White	10.4	0.50	200	5
	EP5X-2E00	Warm White	10.4	0.50	130	5
	EP5R-2E00	Red	8.4	0.60	130	5
	EP5A-2E00	Amber	8.4	0.60	130	5
	EP5T-2E00	True Green	10.4	0.50	130	5
	EP5B-2E00	Blue	10.4	0.50	60	5
Power Consumption	Part Name	Color	Typ. Voltage (V)	Test Current (A)	Luminous Flux (lm)	Thermal Resistance To Case (°C/W)
10W	EPAW-2E00	White	17.5	0.645	400	2
	EPAX-2E00	Warm White	17.5	0.645	250	2
	EPAR-2E00	Red	10.5	0.960	250	2
	EPAA-2E00	Amber	10.5	0.960	250	2
	EPAT-2E00	True Green	17.5	0.645	250	2
	EPAB-2E00	Blue	17.5	0.645	120	2

Power Consumption	Part Name	Color	Typ. Voltage (V)	Test Current (A)	Luminous Flux (lm)	Thermal Resistance To Case (°C/W)
20W	EPBW-4E00	White	17.8	1.12	700	2
	EPBX-4E00	Warm White	17.8	1.12	450	2
	EPBR-4E00	Red	10.5	1.90	500	2
	EPBA-4E00	Amber	10.5	1.90	500	2
	EPBT-4E00	True Green	17.8	1.12	500	2
	EPBB-4E00	Blue	17.8	1.12	240	2

JEDEC Moisture Sensitivity:

Level	Floor Life		Soak Requirements			
	Time	Conditions	Standard		Accelerated Environment	
			Time (hours)	Conditions	Time (hours)	Conditions
2a	4 weeks	≤30°C / 60% RH	696 +5/-0	30°C / 60% RH	120 +0.5/-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/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

- 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 (λ_d)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 (λ_d)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	EP5W-2E00	White	9.3	10.2	11.4
	EP5X-2E00	Warm White	9.3	10.2	11.4
	EP5R-2E00	Red	8.0	9.2	10.8
	EP5A-2E00	Amber	8.0	9.2	10.8
	EP5T-2E00	True Green	9.3	10.2	11.4
	EP5B-2E00	Blue	9.3	10.2	11.4

Power Consumption	Part Name	Color	Min. Voltage (V)	Typ. Voltage (V)	Max. Voltage (V)
10W	EPAW-2E00	White	16.6	17.2	18.3
	EPAX-2E00	Warm White	16.6	17.2	18.3
	EPAR-2E00	Red	11.0	12.1	13.0
	EPAA-2E00	Amber	11.0	12.1	13.0
	EPAT-2E00	True Green	16.6	17.2	18.3
	EPAB-2E00	Blue	16.6	17.2	18.3

Power Consumption	Part Name	Color	Min. Voltage (V)	Typ. Voltage (V)	Max. Voltage (V)
20W	EPBW-4E00	White	16.6	17.8	18.3
	EPBX-4E00	Warm White	16.6	17.8	18.3
	EPBR-4E00	Red	11.0	12.1	13.0
	EPBA-4E00	Amber	11.0	12.1	13.0
	EPBT-4E00	True Green	16.6	17.8	18.3
	EPBB-4E00	Blue	16.6	17.8	18.3

Voltage bin

Power Consumption	Part Name	Color	Bin Group		Bin Group	
5W	EP5W-2E00	White	VW01	9.3~10.1	VW02	10.2~10.8
	EP5X-2E00	Warm White	VX01	9.3~10.1	VX02	10.2~10.8
	EP5R-2E00	Red	VR01	8.0~9.1	VR02	9.2~10.8
	EP5A-2E00	Amber	VA01	8.0~9.1	VA02	9.2~10.8
	EP5T-2E00	True Green	VT01	9.3~10.1	VT02	10.2~10.8
	EP5B-2E00	Blue	VB01	9.3~10.1	VB02	10.2~10.8

Power Consumption	Part Name	Color	Bin Group		Bin Group	
10W	EPAW-2E00	White	VW01	16.6~17.1	VW02	17.2~18.3
	EPAX-2E00	Warm White	VX01	16.6~17.1	VX02	17.2~18.3
	EPAR-2E00	Red	VR01	11.0~12.0	VR02	12.1~13.0
	EPAA-2E00	Amber	VA01	11.0~12.0	VA02	12.1~13.0
	EPAT-2E00	True Green	VT01	16.6~17.1	VT02	17.2~18.3
	EPAB-2E00	Blue	VB01	16.6~17.1	VB02	17.2~18.3

Power Consumption	Part Name	Color	Bin Group		Bin Group	
20W	EPBW-4E00	White	VW01	16.6~17.1	VW02	17.2~18.3
	EPBX-4E00	Warm White	VX01	16.6~17.1	VX02	17.2~18.3
	EPBR-4E00	Red	VR01	11.0~12.0	VR02	12.1~13.0
	EPBA-4E00	Amber	VA01	11.0~12.0	VA02	12.1~13.0
	EPBT-4E00	True Green	VT01	16.6~17.1	VT02	17.2~18.3
	EPBB-4E00	Blue	VB01	16.6~17.1	VB02	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	EP5W-2E00	White	3 series 4 parallel	Only emitter
	EP5X-2E00	Warm White	3 series 4 parallel	Only emitter
	EP5R-2E00	Red	4 series 4 parallel	Only emitter
	EP5A-2E00	Amber	4 series 4 parallel	Only emitter
	EP5T-2E00	True Green	3 series 4 parallel	Only emitter
	EP5B-2E00	Blue	3 series 4 parallel	Only emitter
Power Consumption	Part Name	Color	Chip Connection	Note
10W	EPAW-2E00	White	5 series 4 parallel	Only emitter
	EPAX-2E00	Warm White	5 series 4 parallel	Only emitter
	EPAR-2E00	Red	5 series 5 parallel	Only emitter
	EPAA-2E00	Amber	5 series 5 parallel	Only emitter
	EPAT-2E00	True Green	5 series 4 parallel	Only emitter
	EPAB-2E00	Blue	5 series 4 parallel	Only emitter

Power Consumption	Part Name	Color	Chip Connection	Note
20W	EPBW-4E00	White	5 series 4 parallel	Only emitter
	EPBX-4E00	Warm White	5 series 4 parallel	Only emitter
	EPBR-4E00	Red	5 series 5 parallel	Only emitter
	EPBA-4E00	Amber	5 series 5 parallel	Only emitter
	EPBT-4E00	True Green	5 series 4 parallel	Only emitter
	EPBB-4E00	Blue	5 series 4 parallel	Only emitter

Power Consumption	Part Name	Color	Chip Connection	Note
5W	EP5W-2S00	White	3 series 4 parallel	With Aluminum PCB
	EP5X-2S00	Warm White	3 series 4 parallel	With Aluminum PCB
	EP5R-2S00	Red	4 series 4 parallel	With Aluminum PCB
	EP5A-2S00	Amber	4 series 4 parallel	With Aluminum PCB
	EP5T-2S00	True Green	3 series 4 parallel	With Aluminum PCB
	EP5B-2S00	Blue	3 series 4 parallel	With Aluminum PCB

Power Consumption	Part Name	Color	Chip Connection	Note
10W	EPAW-2S00	White	5 series 4 parallel	With Aluminum PCB
	EPAX-2S00	Warm White	5 series 4 parallel	With Aluminum PCB
	EPAR-2S00	Red	5 series 5 parallel	With Aluminum PCB
	EPAA-2S00	Amber	5 series 5 parallel	With Aluminum PCB
	EPAT-2S00	True Green	5 series 4 parallel	With Aluminum PCB
	EPAB-2S00	Blue	5 series 4 parallel	With Aluminum PCB

Power Consumption	Part Name	Color	Chip Connection	Note
20W	EPBW-4S00	White	5 series 4 parallel	With Aluminum PCB
	EPBX-4S00	Warm White	5 series 4 parallel	With Aluminum PCB
	EPBR-4S00	Red	5 series 5 parallel	With Aluminum PCB
	EPBA-4S00	Amber	5 series 5 parallel	With Aluminum PCB
	EPBT-4S00	True Green	5 series 4 parallel	With Aluminum PCB
	EPBB-4S00	Blue	5 series 4 parallel	With Aluminum PCB

EdiPower Reliability

When we talk about MTBF of EdiPower, 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 decay 30% (L70%)

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

ASSIST FORM about High Power LED Reliability (5W EdiPower 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 EdiPower 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 EdiPower 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

$$\Delta T=5 \times 5=25 \text{ } ^\circ\text{C}$$

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

For 10W device $\Delta T=3 \times 10=30 \text{ } ^\circ\text{C}$

For 20W device $\Delta T=3 \times 20=60 \text{ } ^\circ\text{C}$

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)= $\frac{200}{1.4 \times (8.4 \times 8.4)} = 2.0$

For 5W device $\Delta T=2 \times 5=10 \text{ } ^\circ\text{C}$

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

Then Rth(case-board)= $\frac{200}{1.4 \times (14.5 \times 14.5)} = 0.7$

For 10W device $\Delta T=0.7 \times 10=7 \text{ } ^\circ\text{C}$

For 20W device $\Delta T=0.7 \times 20=14 \text{ } ^\circ\text{C}$

c. board to air

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

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

For 5W

If heat sink area is 100cm² Rth=5.0

If heat sink area is 150cm² Rth=3.3

For 10W and 20W

If heat sink area is 300cm² Rth=1.7

If heat sink area is 600cm² Rth=0.8

d. ΔT totally

For 5W

If heat sink area is 100cm^2 $R_{th}=5.0$ $\Delta T=25+10+5 \times 5=60^\circ\text{C}$

If heat sink area is 150cm^2 $R_{th}=3.3$ $\Delta T=25+10+3.3 \times 5=51.5^\circ\text{C}$

For 10W

If heat sink area is 300cm^2 $R_{th}=1.7$ $\Delta T=20+7+1.7 \times 10=44^\circ\text{C}$

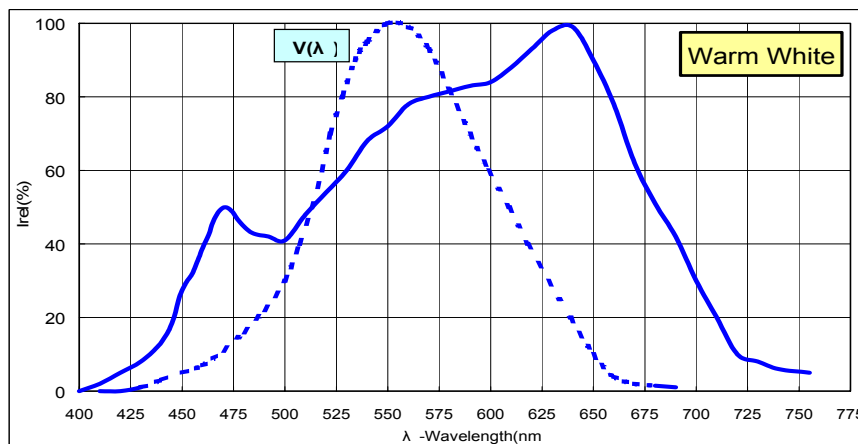
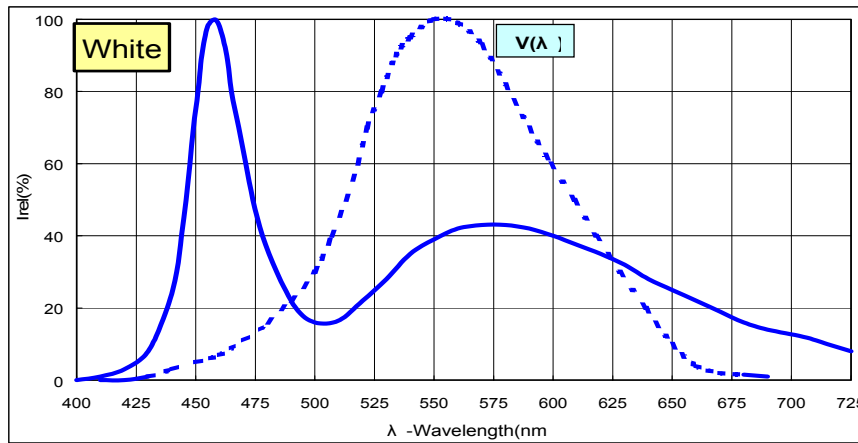
If heat sink area is 600cm^2 $R_{th}=0.8$ $\Delta T=20+7+0.8 \times 10=35^\circ\text{C}$

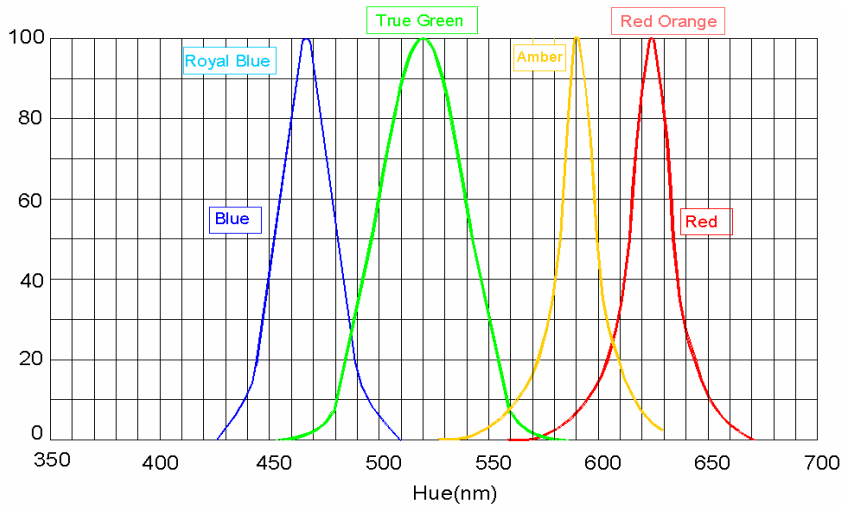
For 20W

If heat sink area is 300cm^2 $R_{th}=1.7$ $\Delta T=40+14+1.7 \times 20=88^\circ\text{C}$

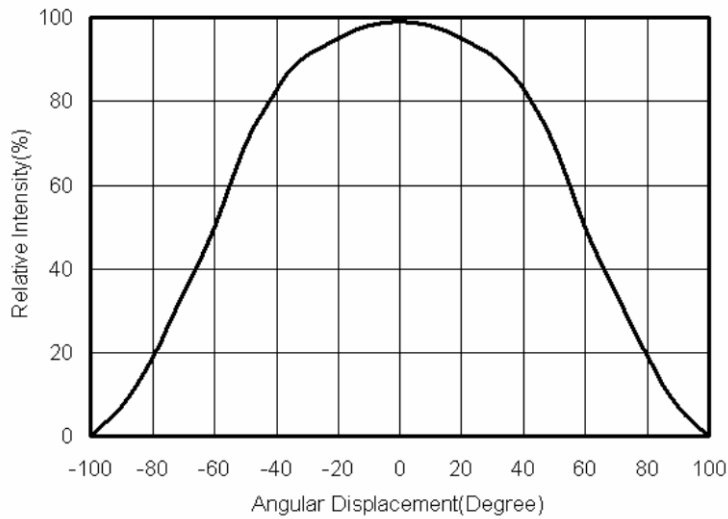
If heat sink area is 600cm^2 $R_{th}=0.8$ $\Delta T=40+14+0.8 \times 20=70^\circ\text{C}$

Electrical & Optical Curves-Spectrum

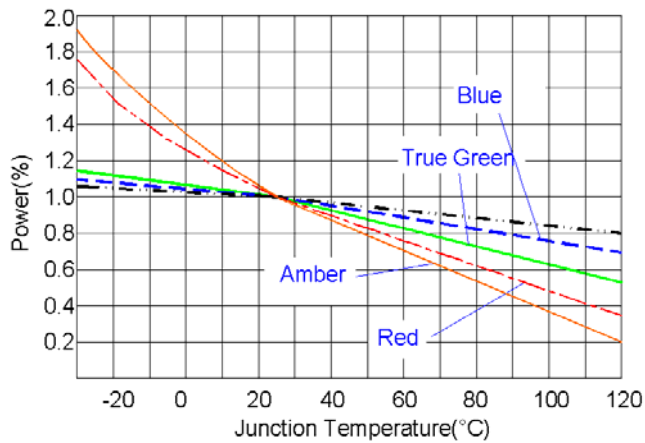




Typical Radiation Pattern (5W, 10W, 20W, White, Warm White, Blue, Green, Amber and Red)



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

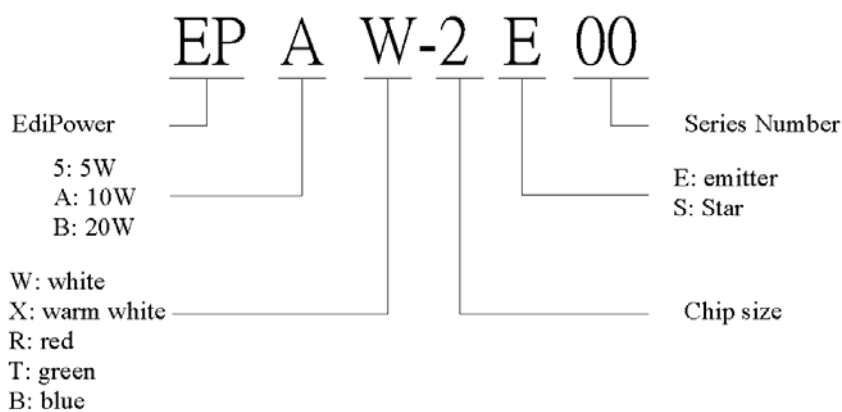
Package

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

Label

艾笛森光電股份有限公司 EDISON OPTO CORPORATION Part No: _____	Group: _____ Color: _____	Quantity: _____ Pcs Lot No: _____
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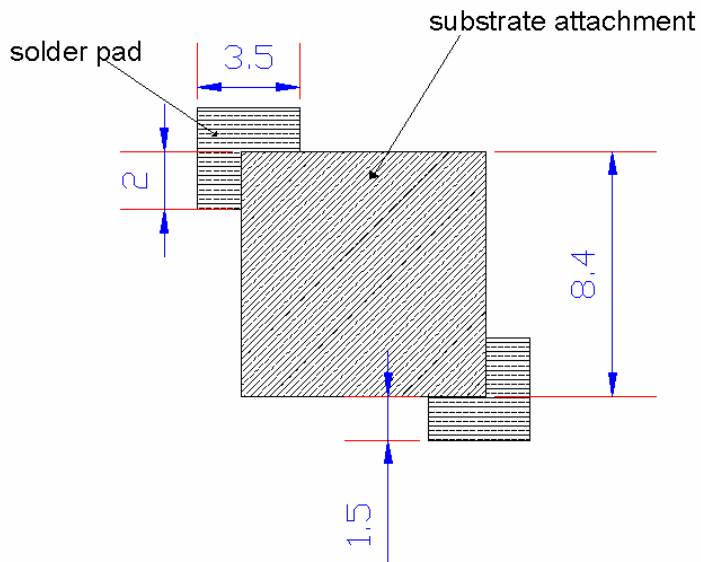


Note: Package storage condition will be limited in temperature 20~30°C, RH 40~50%

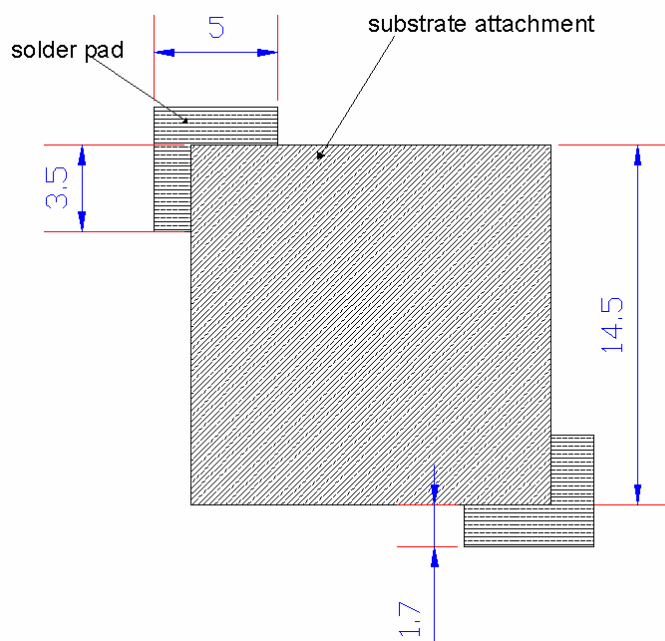
Manual Soldering: It is strongly recommended that solder tip temperature is limited under 400°C
10 seconds 3 times. Damage to the silicone layer can cause emitter failure.

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°C 20 minutes

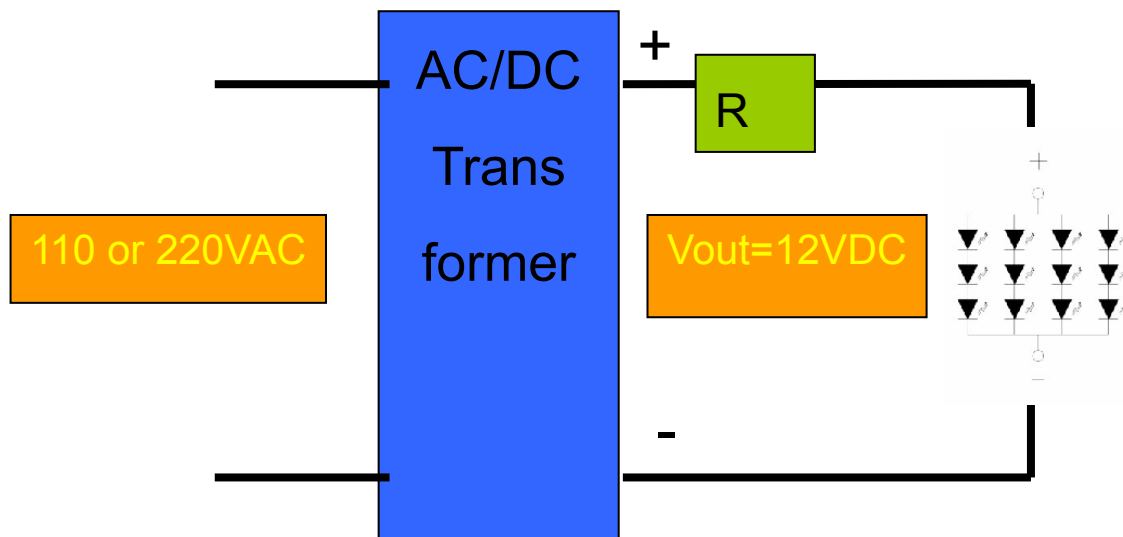
Handling Precautions:

1. Please do not use tweezers 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 EdiPower 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.

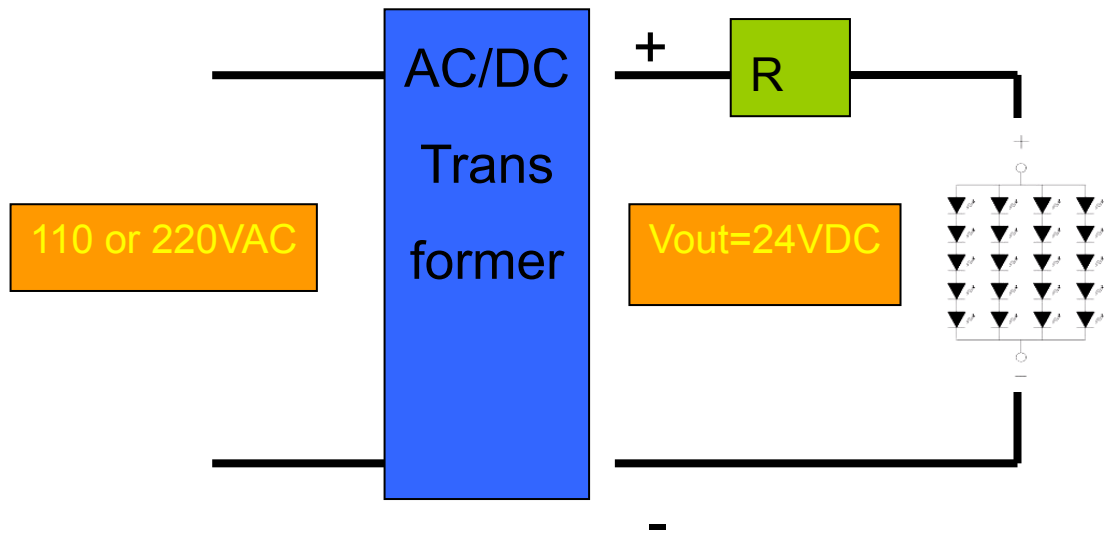
5W



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

R=6 Ω for red and Amber

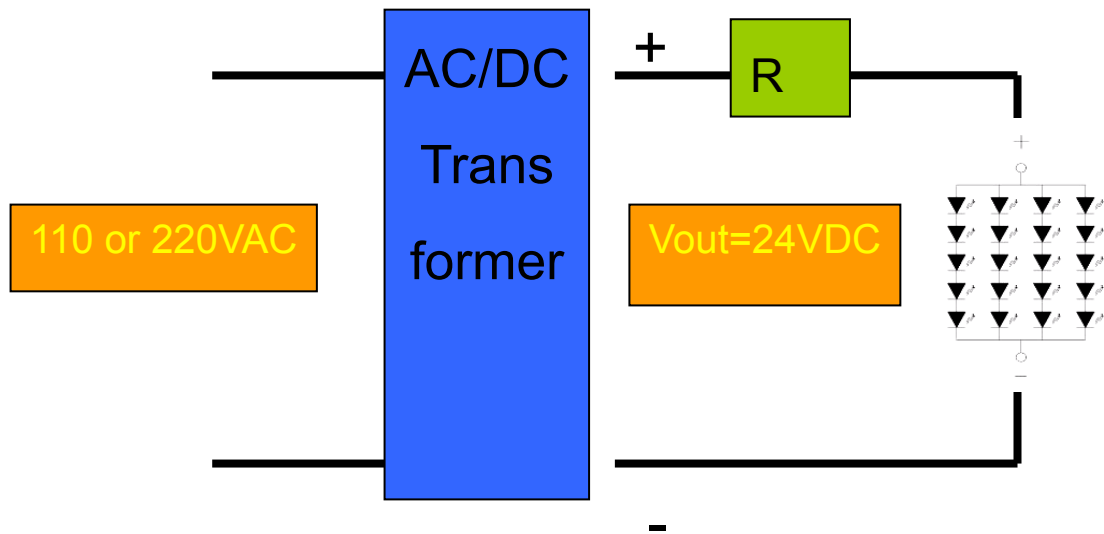
10W



$R=10\Omega$ for White, Warm White, Green, Blue

$R=2\Omega$ for Red and Amber

20W



$R=5\Omega$ 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