Edixeon® S Series



Edixeon® S series emitters are one of the high power LEDs packaged by Edison-Opto delivering high luminous flux in the world. With its advanced packaging process, Edixeon® S is introduced to satisfy various solid-state lighting applications such as automotive headlamp, decorative wall washer and general lighting. Edixeon® S series emitters have a typical luminous output of 110 lumens at 350mA, and are built specifically for reflow process. Unlike most fluorescent sources, Edixeon® S series contains no mercury and is more energy efficient than incandescent and halogen light source.

Features

- Various colors
- More energy efficient than incandescent and most halogen lamps
- Low voltage operation
- Instant light
- Long operating life
- Reflow process compatible

Copyright©2010 Edison Opto. All rights reserved.

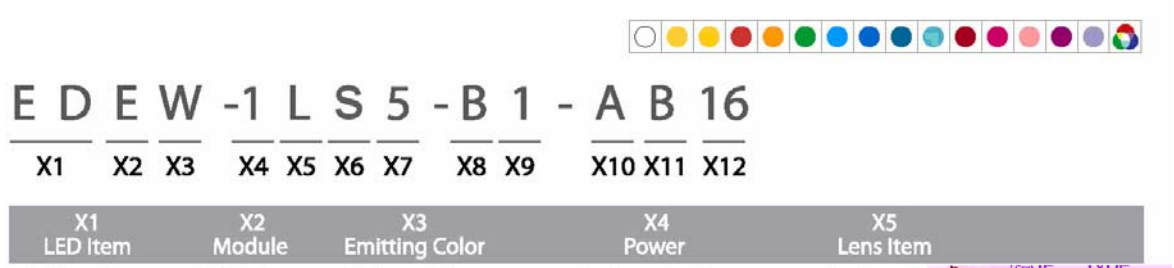
Table of Contents

Product Nomenclature 2
Environmental Compliance 3
LED Package Dimensions and Polarity 4
LED Package with Star Dimensions and Polarity 5
Absolute Maximum Ratings 6
Luminous Flux Characteristics 7
Forward Voltage Characteristics 9
JEDEC Information 11
Reliability Items and Failure Measures 12
Color Spectrum and Radiation Pattern 13
Optical & Electrical Characteristics 21
Product Soldering Instructions 29
Product Thermal Application Information 33
Product Electrical Application Information 38
Product Packaging Information 39
Star Product Packaging Information 41

Product Nomenclature

The following table describes the available color, power, and lens type. For more flux and forward voltage information, please consult the Bin Group document.

< Table 1. Edixeon® S series nomenclature >



X1 LED Item		X2 Module		X3 Emitting Color		X4 Power		X5 Lens Item	
E	Emitter	W	Cool White	S	Stage Lighting (3W)	L	Lambertian (140°)	ED	Edixeon®
S	Star	H	Neutral White	1	1W				
		X	Warm White	3	3W				

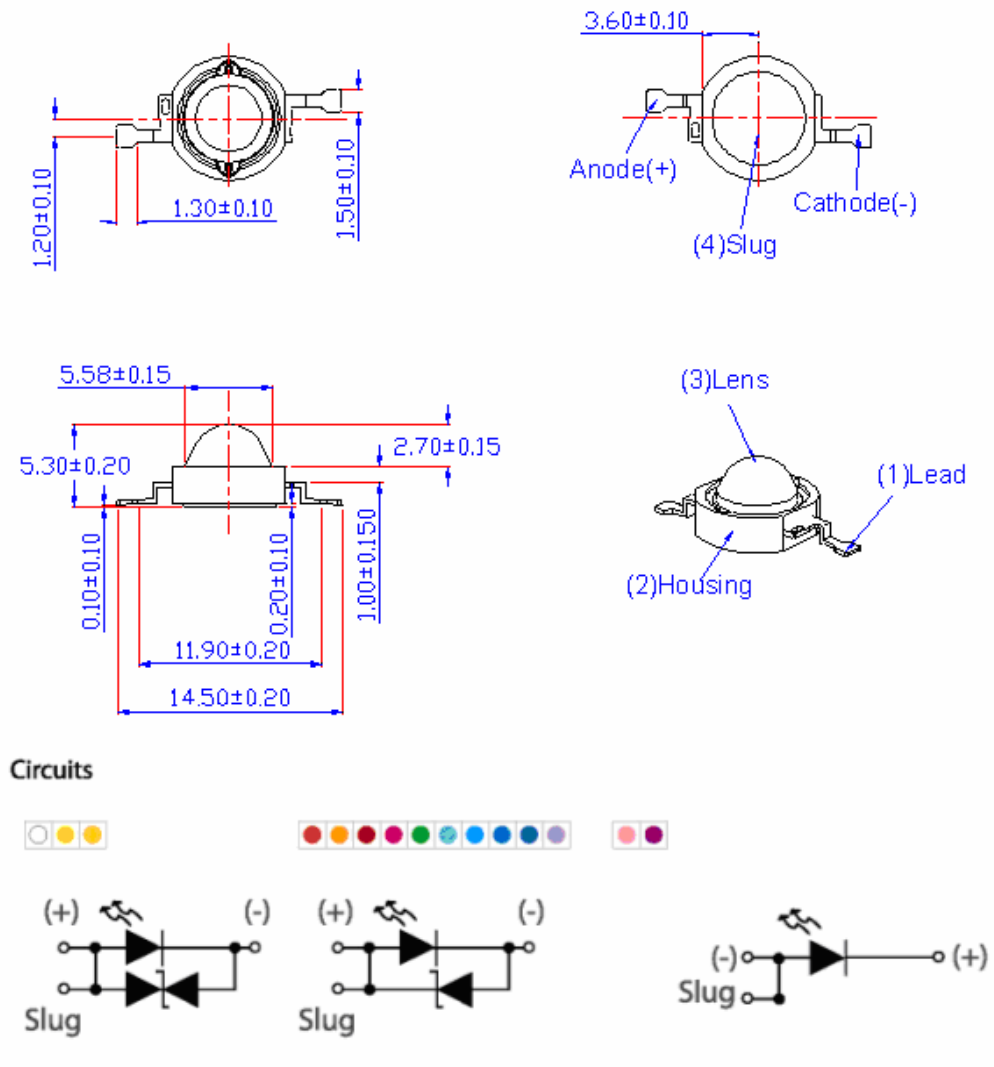
R	Red
A	Amber
T	True Green
B	Blue
D	Dental Blue
C	Royal Blue
J	Cyan
E	Deep Red
F	Cherry Red
I	IR 850nm
N	IR 940nm
V	Ultraviolet

X6~X8 Serial No.	X9 Testing Current		X10 Shape Item		X11 Al PCB Color		X12 Thickness	
Code	Type	Code	Type	Code	Type	Code	Type
1	350mA	A	Star	W	White	16	1.6mm
3	700mA	B	Square(25*25mm)	B	Black	20	2.0mm
		C	Square(30*30mm)				

Environmental Compliance

Edixeon® S series are compliant to the Restriction of Hazardous Substances Directive or RoHS. The restricted materials including lead, mercury cadmium hexavalent chromium, polybrominated biphenyls (PBB) and polybrominated diphenyl ether (PBDE) are not used in Edixeon® S series to provide an environmentally friendly product to the customers.

LED Package Dimensions and Polarity



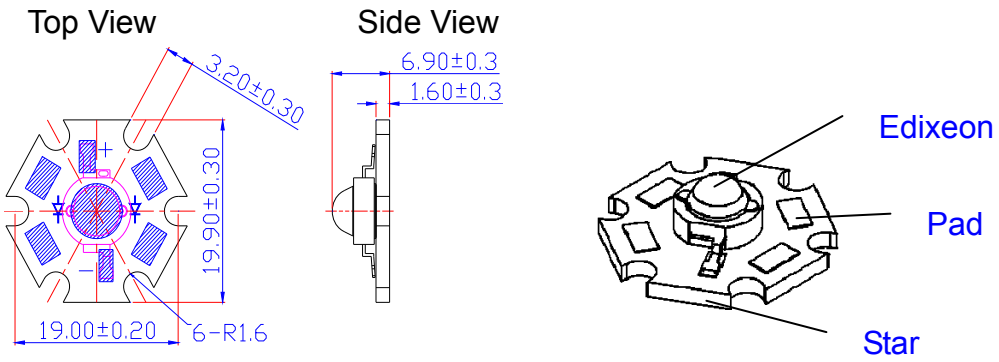
< Figure 1. Edixeon® S series dimensions and circuits >

Notes:

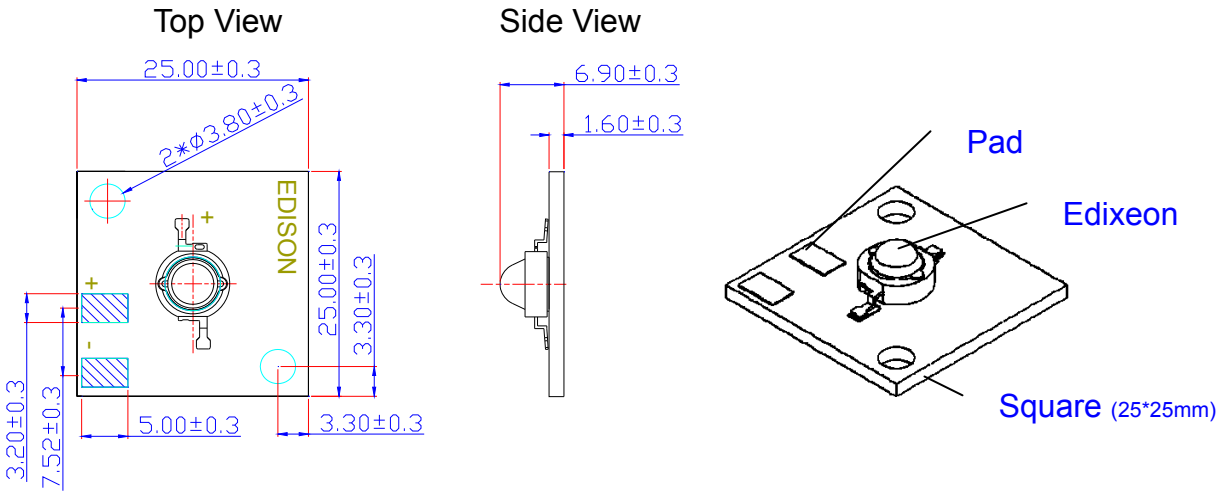
1. All dimensions are measured in mm.
2. Drawings are not to scale.
3. It is strongly recommended to apply on electrically isolated heat conducting film between the slug and contact surfaces.

LED Package with Star Dimensions and Polarity

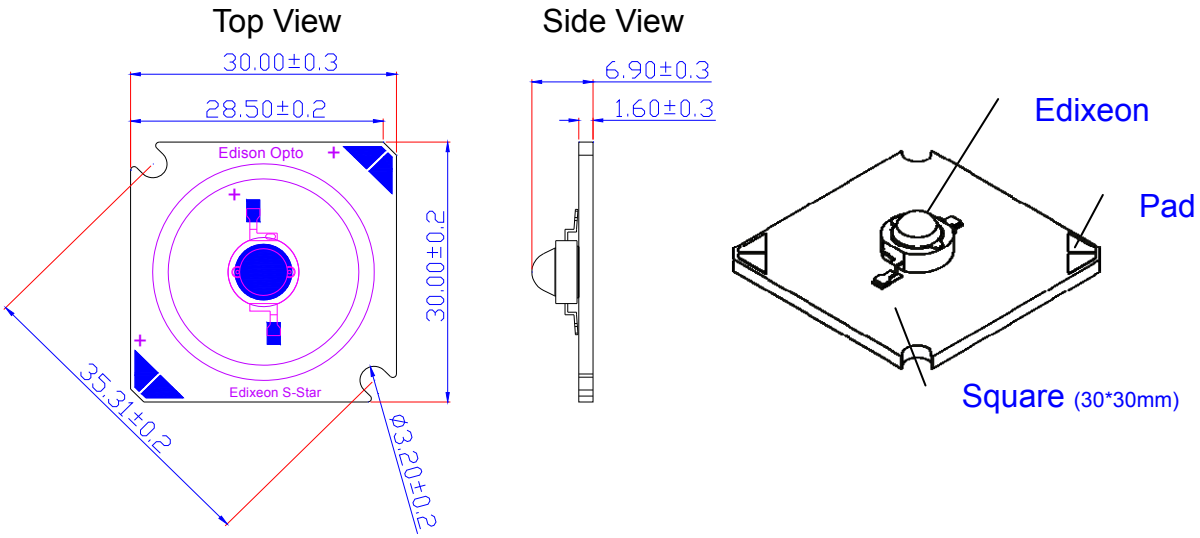
EDSx-xLSx-xx-Ax16



EDSx-xLSx-xx-Bx16



EDSx-xLSx-xx-Cx16



<Figure 2. Edixeon® Star dimensions>

Notes:

1. All Dimensions are in mm.

Absolute Maximum Ratings

The following tables describe the characteristics of Edixeon® S series under various current.

< Table 2. Absolute maximum ratings for Edixeon® S series >

Parameter	Rating(1W)	Rating(3W)	Unit	Symbol
DC Forward Current(1W)	350	700	mA	I_F
Peak pulse current;(tp 100μs, Duty cycle=0.25)	500	1,000	mA	
Reverse Voltage	5	5	V	V_R
Drive Voltage	7	7	V	V_D
LED junction Temperature	125	125		T_j
Operating Temperature	-30 ~ +110	-30 ~ +110		
Storage Temperature	-40 ~ +120	-40 ~ +120		
Soldering Temperature	260	260		
ESD Sensitivity	4,000	4,000	V	V_B
Manual Soldering Time at 260 (Max.)	5	5	Sec.	

Notes:

1. Proper current derating must be observed to maintain junction temperature below the maximum at all time.
2. LEDs are not designed to be driven in reverse bias.
3. Allowable reflow cycles are 3 times for each LED.
4. tp: Pulse width time

The following tables describe thermal resistance of Edixeon® S series under various current and different color.

< Table 3. Temperature Coefficient of Forward Voltage & Thermal Resistance Junction to Case Characteristics at T_J=25 for Edixeon® S series >

Part Name	Color	V_F/ T		$R\theta_{J-B}$	
		Typ.	Units	Typ.	Unit
EDEx-1LSx	--	-2	mV/	13	/W
EDEx-3LSx	--	-2	mV/	13	/W

Luminous Flux Characteristics

The following tables describe flux of Edixeon® S series under various current and different color.

< Table 4. Luminous flux characteristics at I_F=350mA and T_J=25 for 1W Edixeon® S series>

Part Name	Color	Flux	Unit
		Typ.	
EDEW-1LS5-F1	Cool White	110.0	lm
EDEW-1LS5-B1	Cool White	100.0	lm
EDEH-1LS5-E1	Neutral White	85.0	lm
EDEX-1LS5-E1	Warm White	75.0	lm
EDEW-1LS5-D1	Cool White	55.0	lm
EDEH-1LS5-D1	Neutral White	45.0	lm
EDEX-1LS5-D1	Warm White	40.0	lm
EDER - 1LS3	Red	50.0	lm
EDEA – 1LS3	Amber	45	lm
EDET - 1LS1	True Green	70	mW
EDEJ - 1LS1	Cyan	50	lm
EDEB - 1LS5	Blue	20	lm
EDEC - 1LS5	Royal Blue	320	mW
EDED - 1LS5	Dental Blue	320	mW
EDEV - 1LS1	Ultraviolet	180	mW
EDEE - 1LS4	Deep Red	150	mW
EDEF - 1LS3	Cherry Red	130	mW

< Table 5. Luminous flux characteristics at I_F=700mA and T_J=25 for 1W Edixeon® S series>

Part Name	Color	Flux	Unit
		Typ.	
EDEI - 1LS3	IR850	250	mW
EDEN - 1LS3	IR940	140	mW

< Table 6. Luminous flux characteristics at I_F=700mA and T_J=25 for 3W Edixeon® S series>

Part Name	Color	Flux	Unit
		Typ.	
EDEW-3LS5-F3	Cool White	180.0	lm
EDEW-3LS5-B3	Cool White	170.0	lm
EDEH-3LS5-E3	Neutral White	150.0	lm
EDEX-3LS5-E3	Warm White	130.0	lm
EDEW-3LS5-D3	Cool White	80.0	lm
EDEH-3LS5-D3	Neutral White	70.0	lm
EDEX-3LS5-D3	Warm White	65.0	lm
EDER - SLC3-03	Red	85.0	lm
EDET- SLC5-03	True Green	120	lm
EDEB- SLC5-03	Blue	30	lm
EDEC- SLC5-03	Royal Blue	600	mW
EDED- SLC5-03	Dental Blue	600	mW
EDEV- SLC1-03	Ultraviolet	400	mW

Notes:

1. Flux is measured with an accuracy of ± 10%.
2. Cool white、neutral white、warm white emitters are built with InGaN

Forward Voltage Characteristics

The following tables describe forward voltage of Edixeon® S series emitter under various current.

< Table 7. Forward voltage characteristics at I_F=350mA and T_J=25 for 1W Edixeon® S series >

Part Name	Color	V_F Type	Unit
EDEW-1LS5-x1	Cool White	3.4	V
EDEH-1LS5-x1	Neutral White	3.4	V
EDEX-1LS5-x1	Warm White	3.4	V
EDER - 1LS3	Red	2.2	V
EDEA – 1LS3	Amber	2.2	V
EDET - 1LS1	True Green	3.4	V
EDEJ - 1LS1	Cyan	3.4	V
EDEB - 1LS5	Blue	3.4	V
EDEC - 1LS5	Royal Blue	3.4	V
EDED - 1LS5	Dental Blue	3.4	V
EDEV - 1LS1	Ultraviolet	3.4	V
EDEE - 1LS4	Deep Red	2.2	V
EDEF - 1LS3	Cherry Red	2.2	V

< Table 8. Forward voltage characteristics at I_F=700mA and T_J=25 for 1W Edixeon® S series >

Part Name	Color	V_F Type	Unit
EDEI - 1LS3	IR850	1.5~2.5	V
EDEN - 1LS3	IR940	1.5~2.5	V

< Table 9. Forward voltage characteristics at I_F=700mA and T_J=25 for 3W Edixeon® S series >

Part Name	Color	V_F Type	Unit
EDEW-3LS5-x3	Cool White	4.0	V
EDEH-3LS5-x3	Neutral White	4.0	V
EDEX-3LS5-x3	Warm White	4.0	V
EDER - SLC3-03	Red	2.4	V
EDET- SLC5-03	True Green	4.0	V
EDEB- SLC5-03	Blue	4.0	V
EDEC- SLC5-03	Royal Blue	4.0	V
EDED- SLC5-03	Dental Blue	4.0	V
EDEV- SLC1-03	Ultraviolet	4.0	V

JEDEC Information

JEDEC moisture sensitivity classification is used to determine what classification level should be used for initial reliability qualification. Once identified, the LEDs can be properly packaged, stored and handled to avoid subsequent thermal and mechanical damage during the assembly solder reflow attachment and/or repair operation. The present moisture sensitivity standard contains six levels, the lower the level ,the longer the devices floor life. Edixeon® S series are certified at level 2a. This means Edixeon® S series have a floor life of 4 weeks before Edixeon® S series need to re-baked. If the package has been opened more than 1 week or the color of desiccant changes,components should be dried for 10-12 hours at 60 ± 5 .

< Table 10. JEDEC characteristics at T_J=25 for Edixeon® S series>

Level	Floor Life		Soak Requirements				
			Standard		Accelerated Equivalent		
					eV 0.40~0.48	eV 0.30~0.39	Condition
	Time	Condition	Time(hours)	Condition	Time(hours)	Time(hours)	
2a	4 weeks	30 /60% RH	696[1] +5/-0	30 /60% RH	120 +1/-0	168 +1/-0	60 /60% RH

Level	Floor Life		Soak Requirements				
			Standard		Accelerated Equivalent		
					eV 0.40~0.48	eV 0.30~0.39	Condition
	Time	Condition	Time(hours)	Condition	Time(hours)	Time(hours)	
1	Unlimited	30 /85% RH	168 +5/-0	85 /85% RH	NA	NA	NA
2	1 year	30 /60% RH	168 +5/-0	85 /60% RH	NA	NA	NA
2a	4 weeks	30 /60% RH	696[1] +5/-0	30 /60% RH	120 +1/-0	168 +1/-0	60 /60% RH
3	168 hours	30 /60% RH	192[1] +5/-0	30 /60% RH	40 +5/-0	52 +5/-0	60 /60% RH
4	72 hours	30 /60% RH	96[1] +5/-0	30 /60% RH	20 +5/-0	24 +5/-0	60 /60% RH
5	48 hours	30 /60% RH	72[1] +5/-0	30 /60% RH	15 +5/-0	20 +5/-0	60 /60% RH
5a	24 hours	30 /60% RH	48[1] +5/-0	30 /60% RH	10 +5/-0	13 +5/-0	60 /60% RH
6	Time on label (TOL)	30 /60% RH	TOL	30 /60% RH	NA	NA	NA

Notes:

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.
2. Joint Electron Devices Engineering Councils (JEDEC) is the leading developer of standards for the solid-state industry. Almost 3100 participants, appointed by some 290 companies work together in 50 JEDEC committees to meet the needs of every segment of the industry, manufacturers and consumers alike. The publications and standards that they generate are accepted throughout the world. (http://www.jedec.org)

Reliability Items and Failure Measures

Reliability test

The following table describes operating life, mechanical, and environmental tests performed on Edixeon® S series package.

< Table11. Operating life, mechanical, and environmental characteristics and T_J=25 for Edixeon® S series>

Stress Test	Stress Conditions	Stress Duration	Failure Criteria
Room Temperature Operating Life	25 , I_F = I_F Max DC (Note 1)	1,000 hours	Note 2
High Temperature High Humidity Storage Life	85 / 85%RH	1,000 hours	Note 2
High Temperature Storage Life	110	1,000 hours	Note 2
Low Temperature Storage Life	-40	1,000 hours	Note 2
Thermal Shock	-40 / 125 , 15 min dwell / < 10 sec transfer	500 cycles	No catastrophics
Mechanical Shock	1500 G, 0.5 msec pulse, 5 shocks each of 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 ± 5 , 10 sec		No catastrophics

Notes:

1. Depending on the maximum derating curve.
2. Failure Criteria:

Electrical failures

V_F shift >=10%

Light Output Degradation

% Iv shift >= 30% @1,000hrs or 200cycle

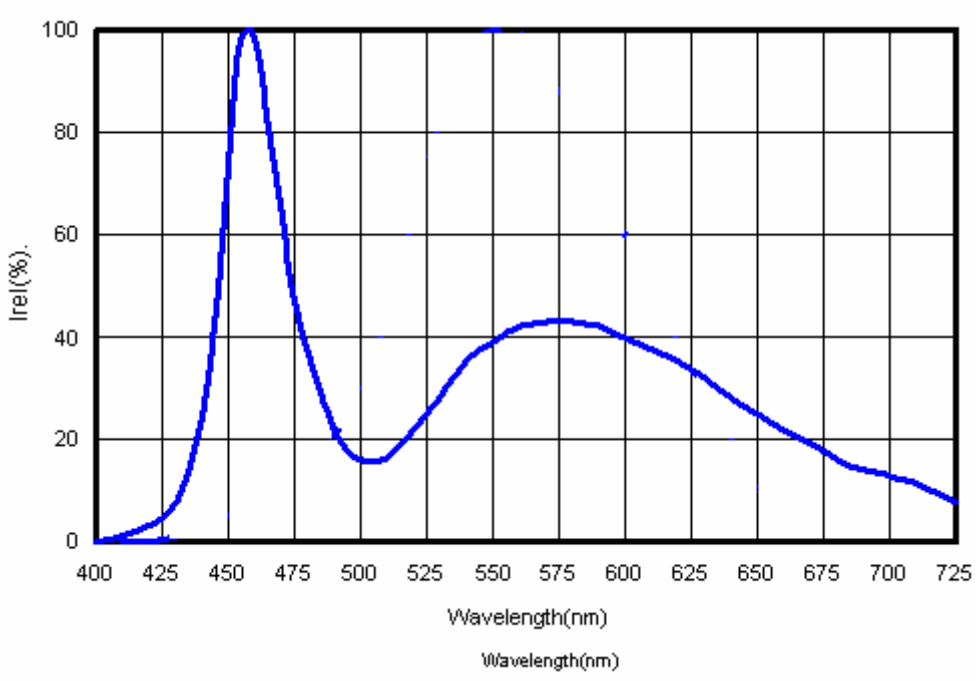
Visual failures

Broken or damaged package or lead

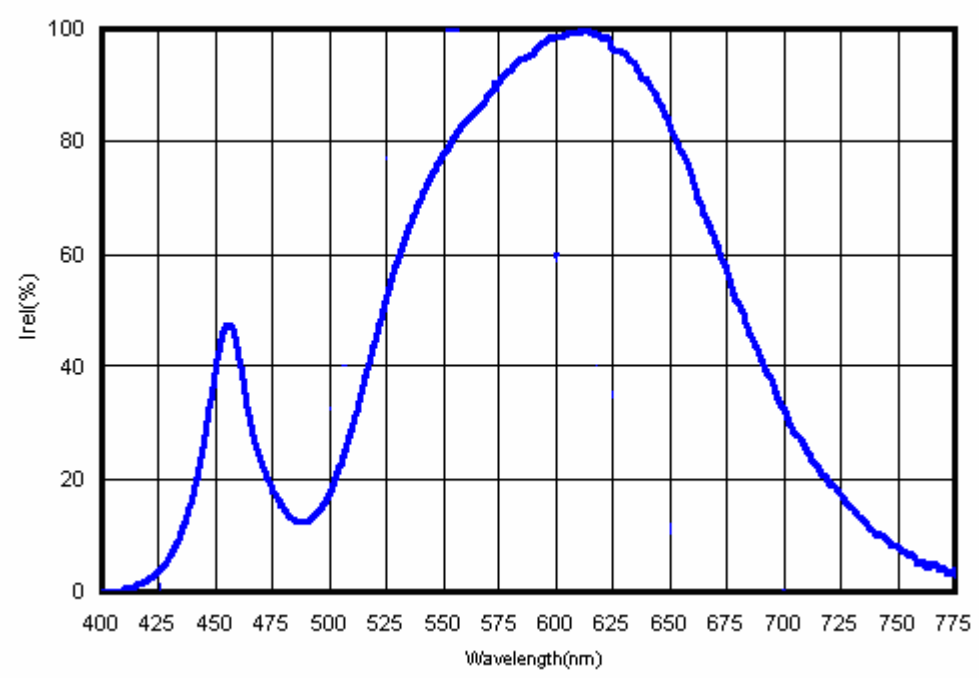
Solderability < 95% wetting

Dimensions out of tolerance

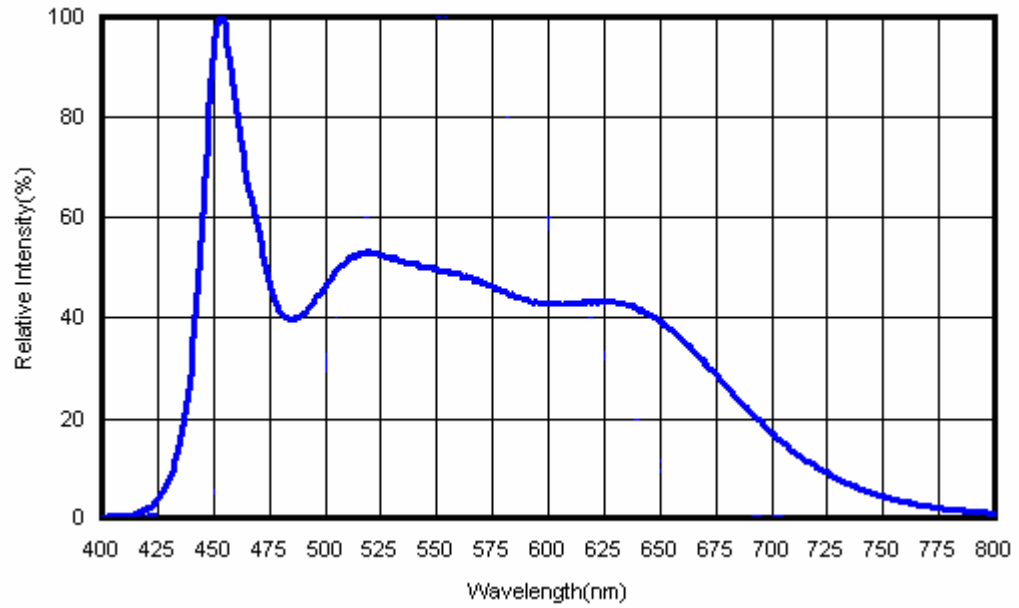
Color Spectrum and Radiation Pattern



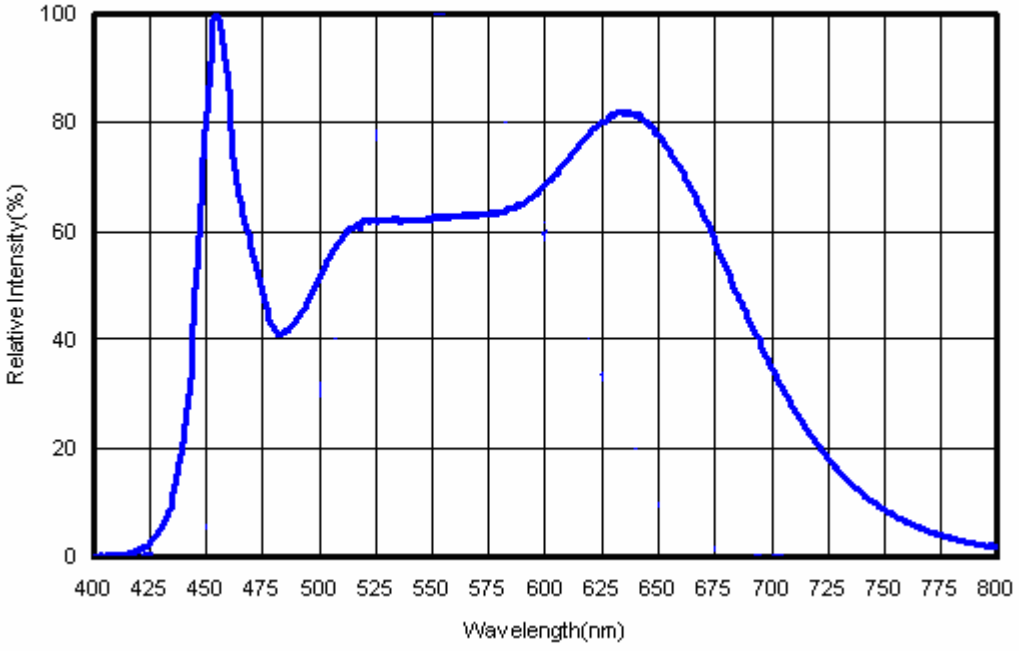
<Figure 3. Cool White color spectrum at T_J =25 .for Edixeon® S series >



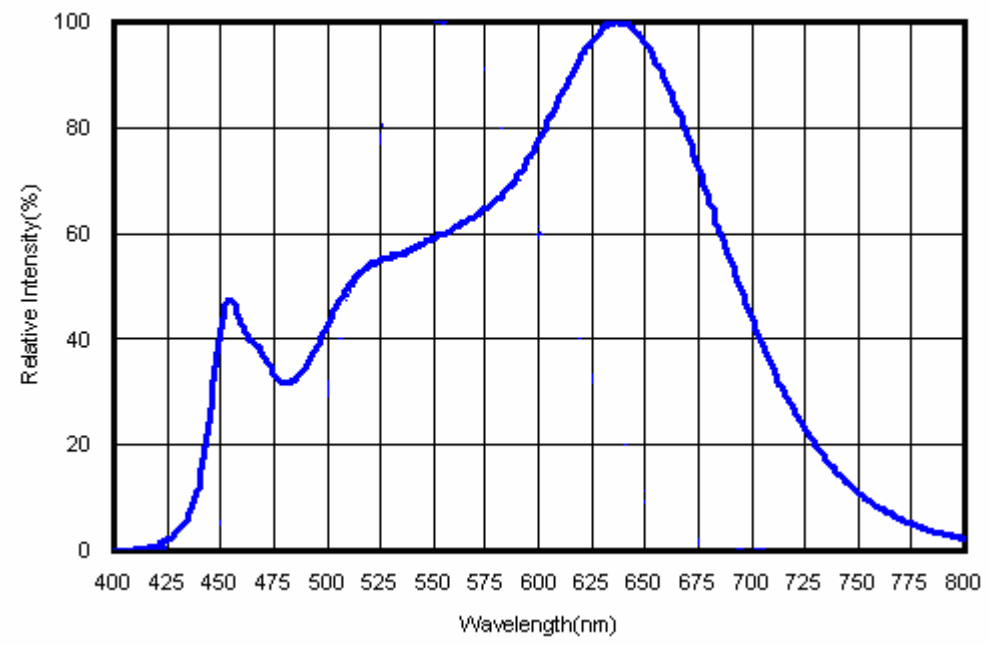
< Figure 4. Neutral White Warm White color spectrum at T_J =25 for Edixeon® S series >



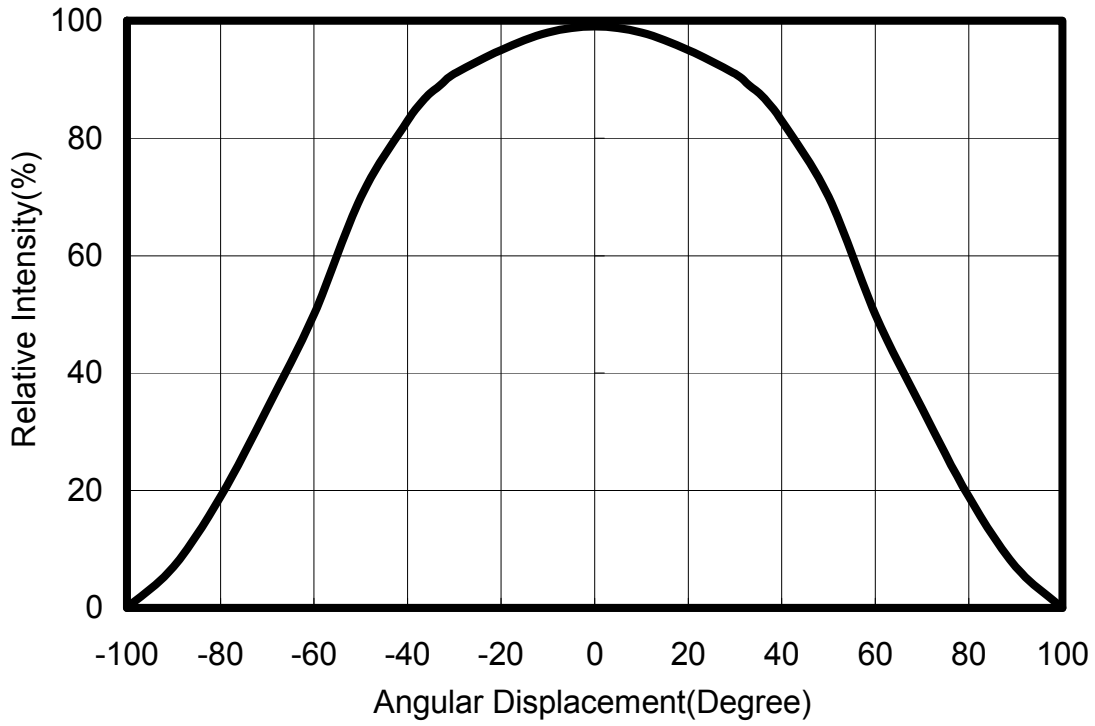
< Figure 5. Cool White color spectrum at T_J =25 .for Edixeon® S series EDEW-xLS5-Dx >



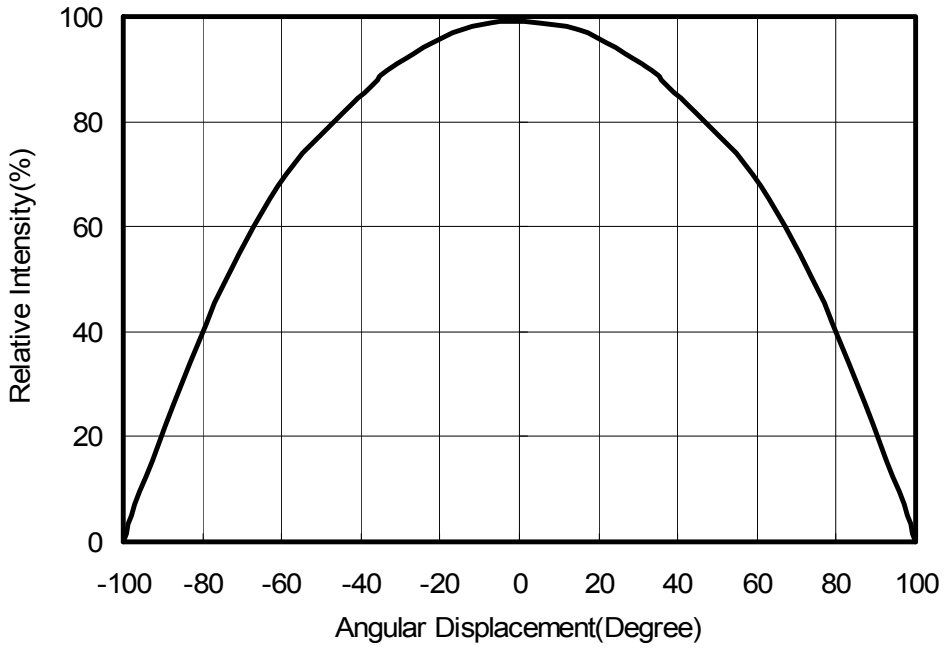
< Figure 6. Neutral White color spectrum at T_J =25 .for Edixeon® S series EDEH-xLS5-Dx>



< Figure 7. Warm White color spectrum at T_J =25 .for Edixeon® S series EDEX-xLS5-Dx >

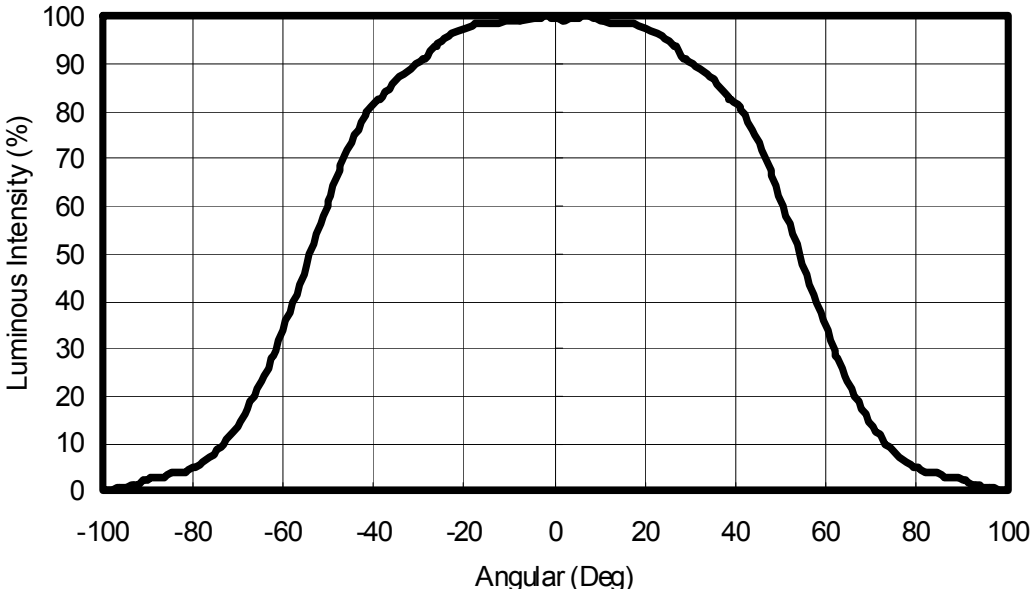


<Figure 8. Lambertain at T_J=25 for Cool White Neutral White Warm White Red Amber Cherry Red Deep Red IR850 IR940.>

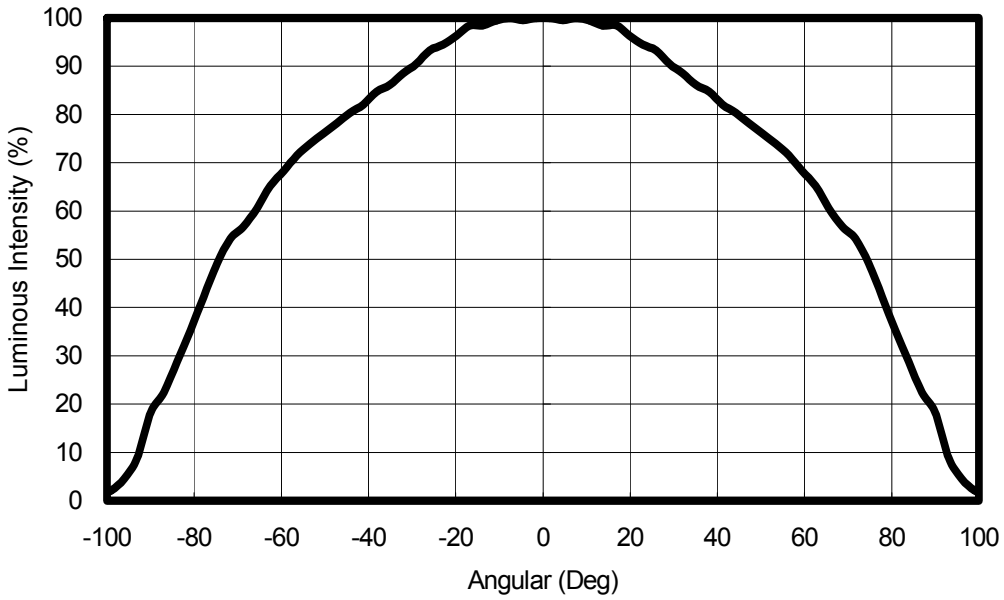


< Figure 9. Lambertain at T_J=25℃ for Blue and True Green Cyan Dental Blue Royal Blue Ultraviolet >

.



< Figure 10.Lambertain Relative Intensity vs. Angular for EDEV-SLC1-03, X direction at T_J=25 .>



< Figure 11.Lambertain Relative Intensity vs. Angular for EDEV-SLC1-03, Y direction at T_J=25 .>

Emission Angle Characteristics

< Table 12. Emission angle Characteristics at T_J=25℃ for Edixeon® S series >

Part Name	Color	2Θ½(Typ.)	Unit
		Lambertian	
EDEW-xLS5-xx	Cool White	120	Deg.
EDEH-xLS5-xx	Neutral White	120	Deg.
EDEX-xLS5-xx	Warm White	120	Deg.
EDER - 1LS3	Red	120	Deg.
EDEA - 1LS3	Amber	120	Deg.
EDEE – 1LS4	Deep Red	120	Deg.
EDEF - 1LS3	Cherry Red	120	Deg.
EDEI - 1LS3	IR850	120	Deg.
EDEN - 1LS3	IR940	120	Deg.
EDET- 1LS1	True Green	150	Deg.
EDEJ- 1LS1	Cyan	150	Deg.
EDEB-1LS5	Blue	150	Deg.
EDEC-1LS5	Royal Blue	150	Deg.
EDED-1LS5	Dental Blue	150	Deg.
EDEV-1LS1	Ultraviolet	150	Deg.
EDER-SLC3-03	Red	150	Deg.
EDET-SLC5-03	True Green	150	Deg.
EDEB-SLC5-03	Blue	150	Deg.
EDEC-SLC5-03	Royal Blue	150	Deg.
EDED-SLC5-03	Dental Blue	150	Deg.
EDEV-SLC1-03	Ultraviolet	X：110 Y：150	Deg.

Notes:

1. Emission is measured with an accuracy of ± 10 Degree.

Color Temperature Characteristics T_J=25

< Table 13. Color Temperature Characteristics at T_J=25 for Edixeon® S series >

Part Name	Color	CCT		Unit
		Min.	Max.	
EDEW-xLS5-xx	Cool White	5,000	10,000	K
EDEH-xLS5-xx	Neutral White	3,800	5,000	K
EDEX-xLS5-xx	Warm White	2,670	3,800	K
EDER - 1LS3	Red	620	630	nm
EDER - SLC3-03	Red	620	630	nm
EDEA – 1LS3	Amber	585	595	nm
EDET - 1LS1	True Green	515	535	nm
EDET- SLC5-03	True Green	515	535	nm
EDEJ – 1LS1	Cyan	490	510	nm
EDEB- SLC5-03	Blue	455	470	nm
EDEB - 1LS5	Blue	455	510	nm
EDEC- SLC5-03	Royal Blue	440	460	nm
EDEC - 1LS5	Royal Blue	440	460	nm
EDED - 1LS5	Dental Blue	450	470	nm
EDED- SLC5-03	Dental Blue	450	470	nm
EDEV - 1LS1	Ultraviolet	395	410	nm
EDEV- SLC1-03	Ultraviolet	395	410	nm
EDEE - 1LS4	Deep Red	650	670	nm
EDEF - 1LS3	Cherry Red	730	750	nm
EDEI - 1LS3	IR850	840	860	nm
EDEN - 1LS3	IR940	930	950	nm

Notes:

1. CCT is measured with an accuracy of ± 200K
2. Wavelength is measured with an accuracy of ± 0.5nm

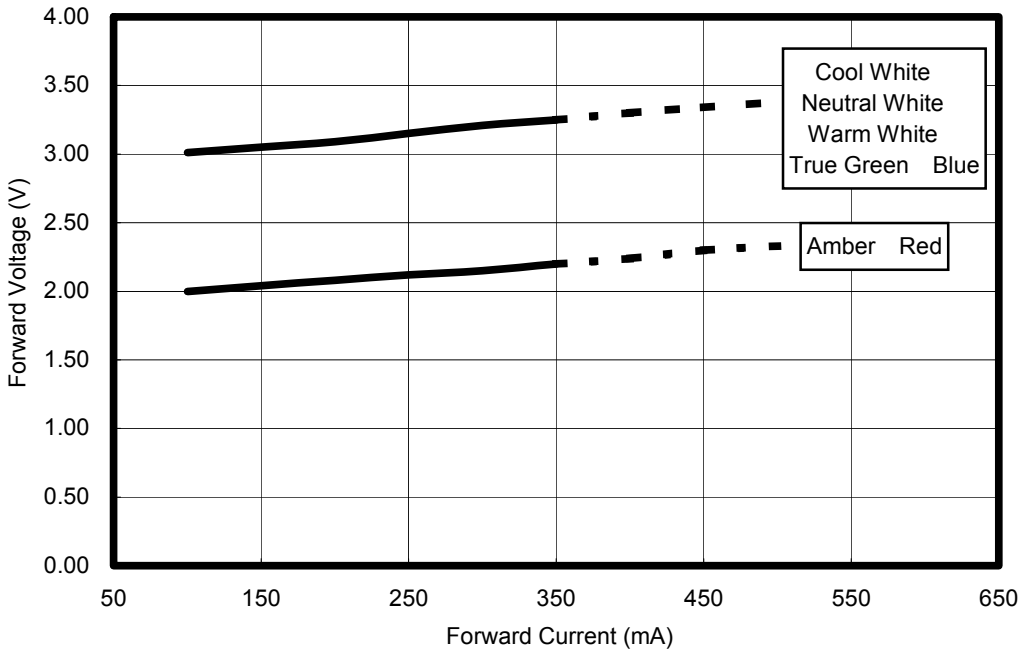
Color Temperature Characteristics T_J=25

< Table 14. Color Rendering Index Characteristics at T_J=25 for Edixeon® S series >

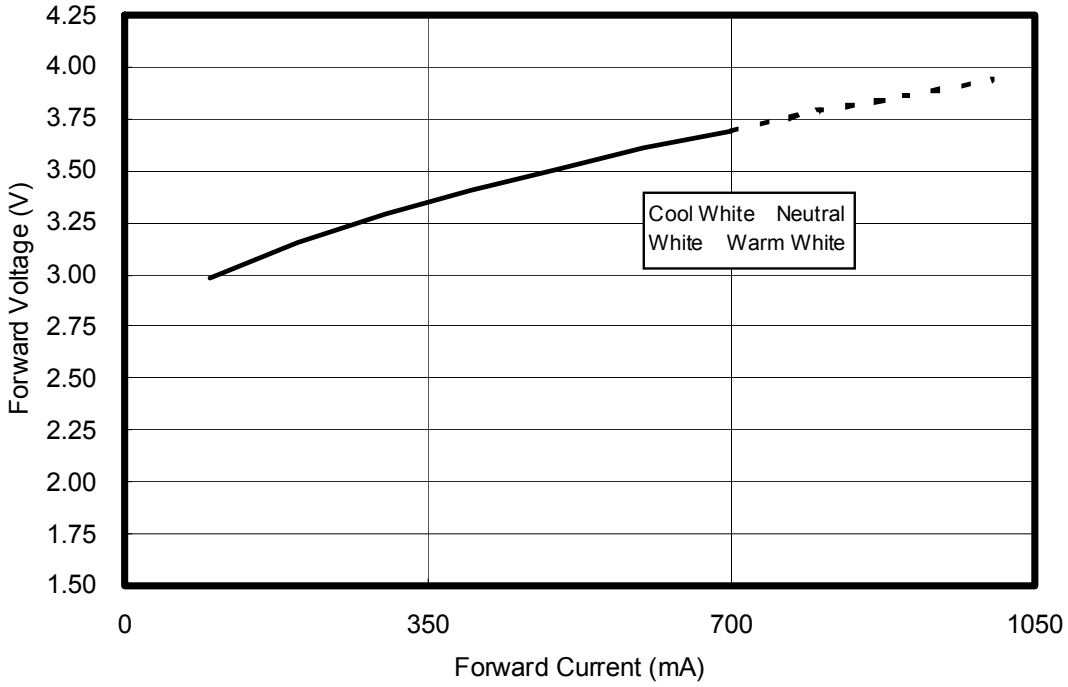
Part Name	Color	CRI
		Typ
EDEW-xLS5-Bx	Cool White	70
EDEW-xLS5-Fx	Cool White	65
EDEH-xLS5-Ex	Neutral White	75
EDEX-xLS5-Ex	Warm White	80
EDEW-xLS5-Dx	Cool White	90
EDEH-xLS5-Dx	Neutral White	90
EDEX-xLS5-Dx	Warm White	90

Notes:

1. CRI is measured with an accuracy of ± 5



< Figure 14. Forward Current & Forward Voltage for 1W Edixeon® S series >



< Figure 15. Forward Current & Forward Voltage for 3W Edixeon® S series >

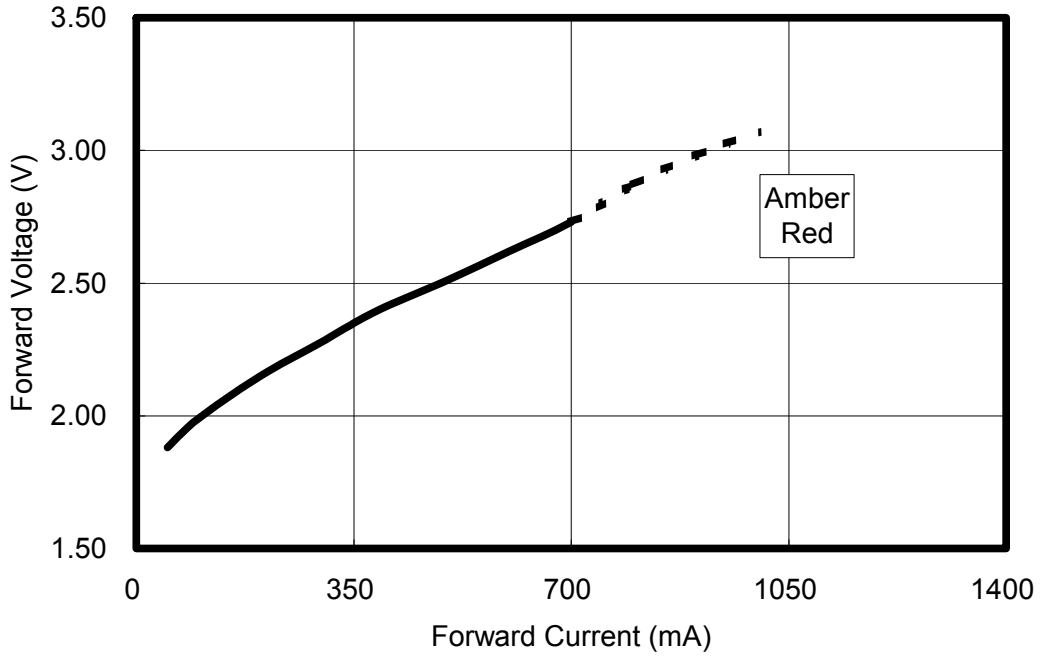
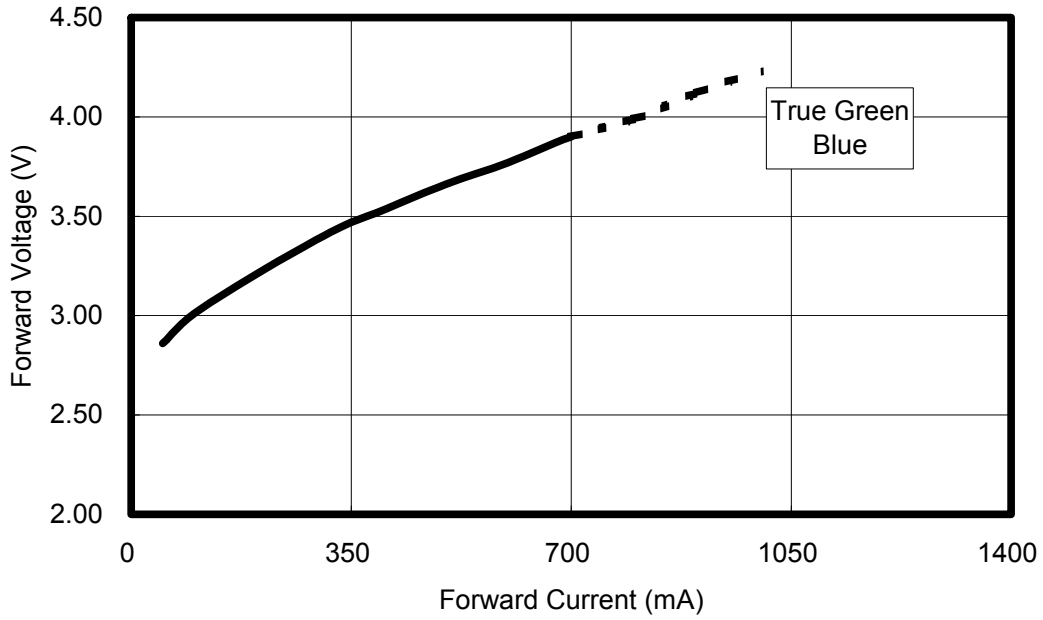
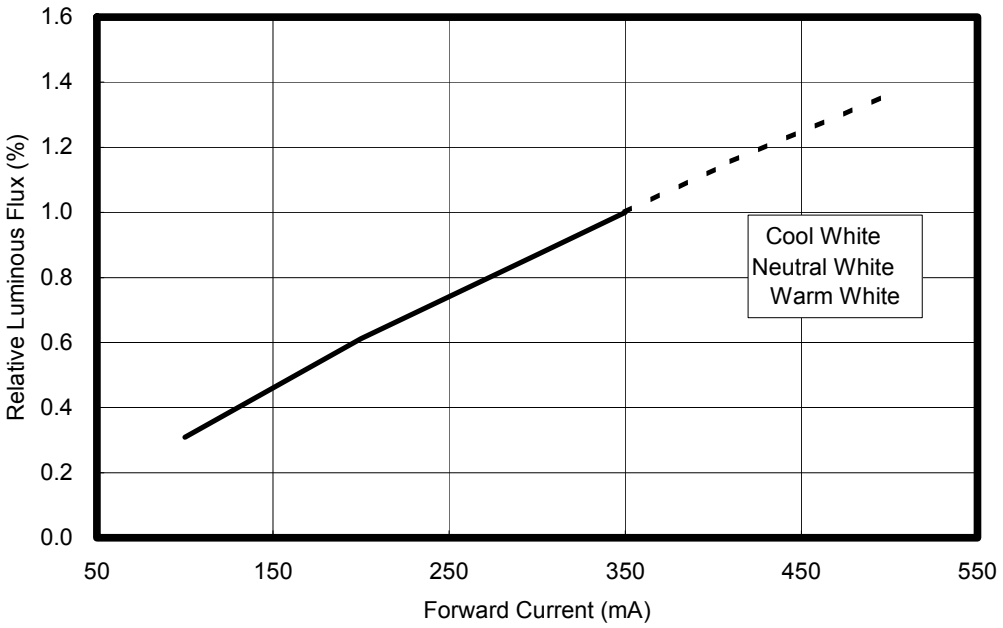


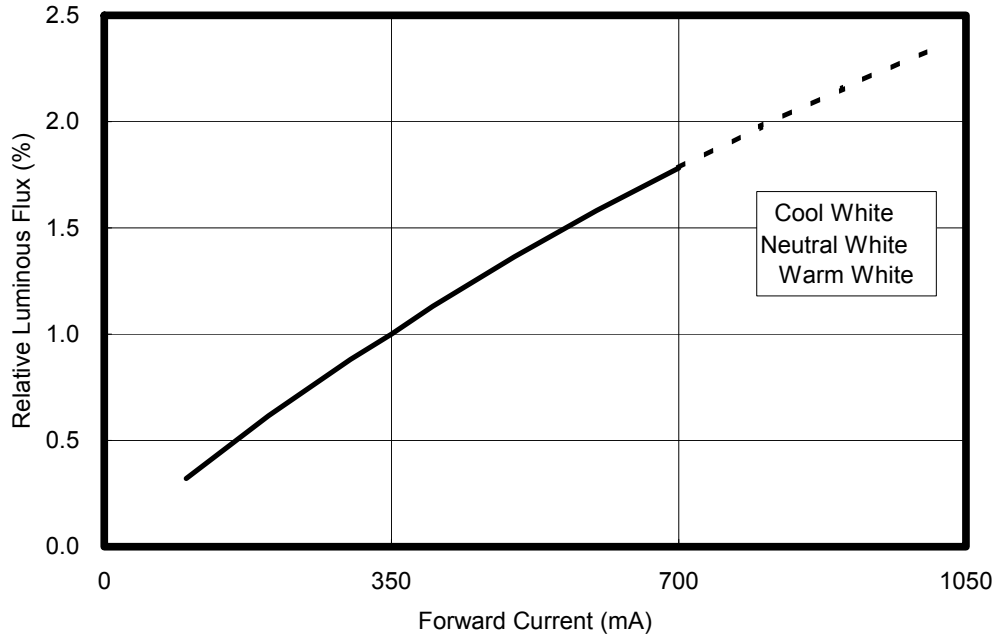
Figure 16. Forward Current & Forward Voltage for 3W Edixeon® S series at T_J=25 >



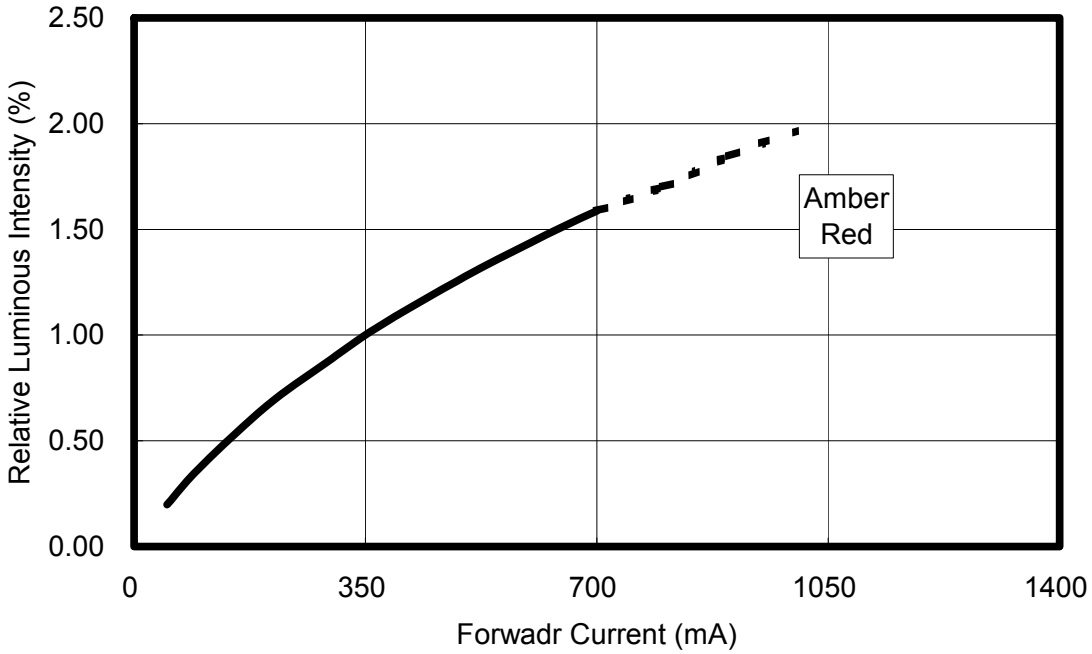
< Figure 17. Forward Current & Forward Voltage for 3W Edixeon® S series at T_J=25 >



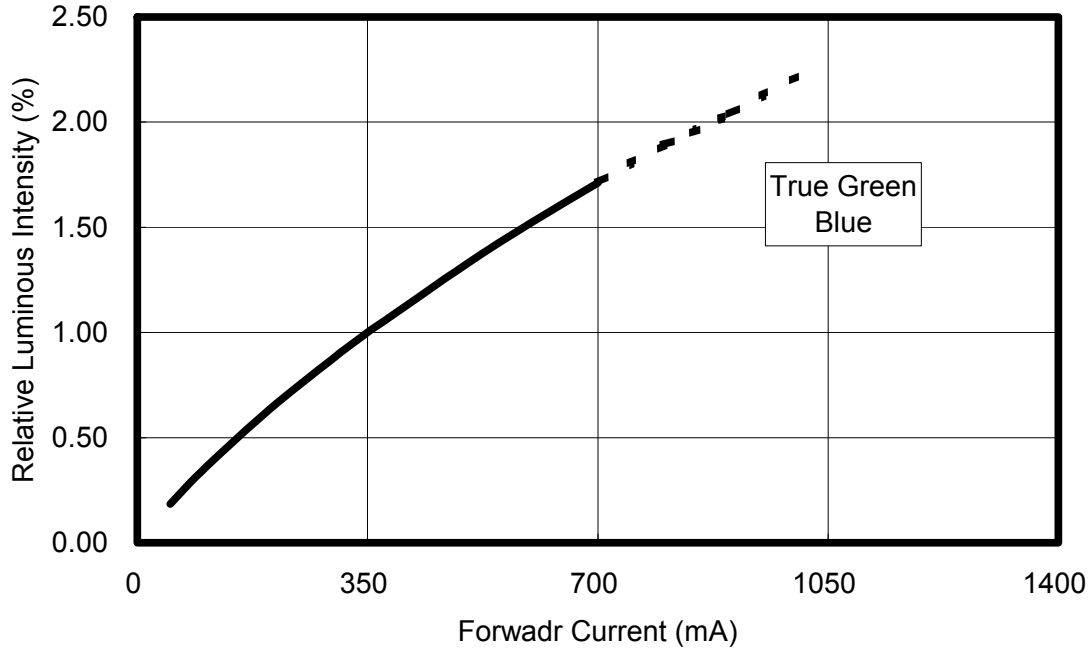
< Figure 18. Forward Current & Relative Luminous at T_J=25 for 1W Edixeon® S series >



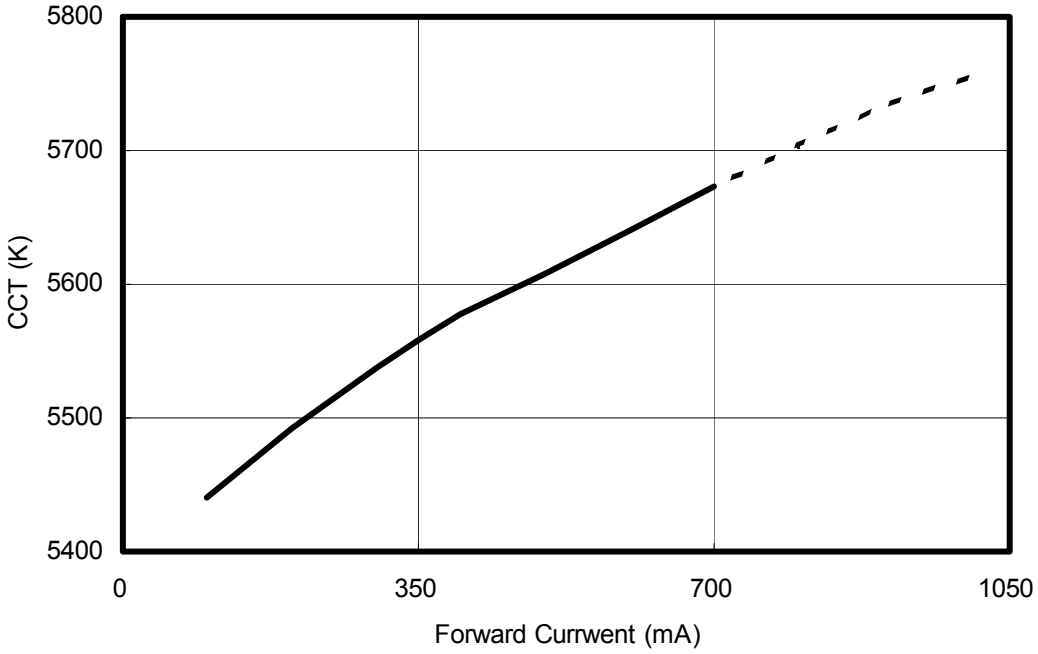
< Figure 19. Forward Current & Relative Luminous at T_J=25 for 3W Edixeon® S series >



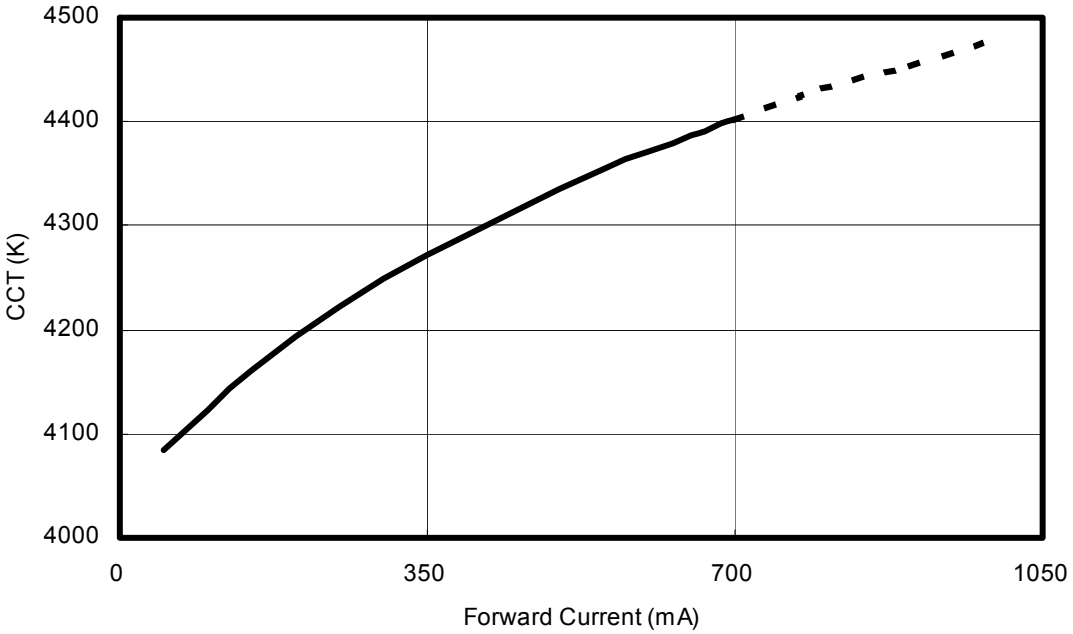
<Figure 20. Forward Current & Relative Luminous for 3W Edixeon® S series at T_J=25 >



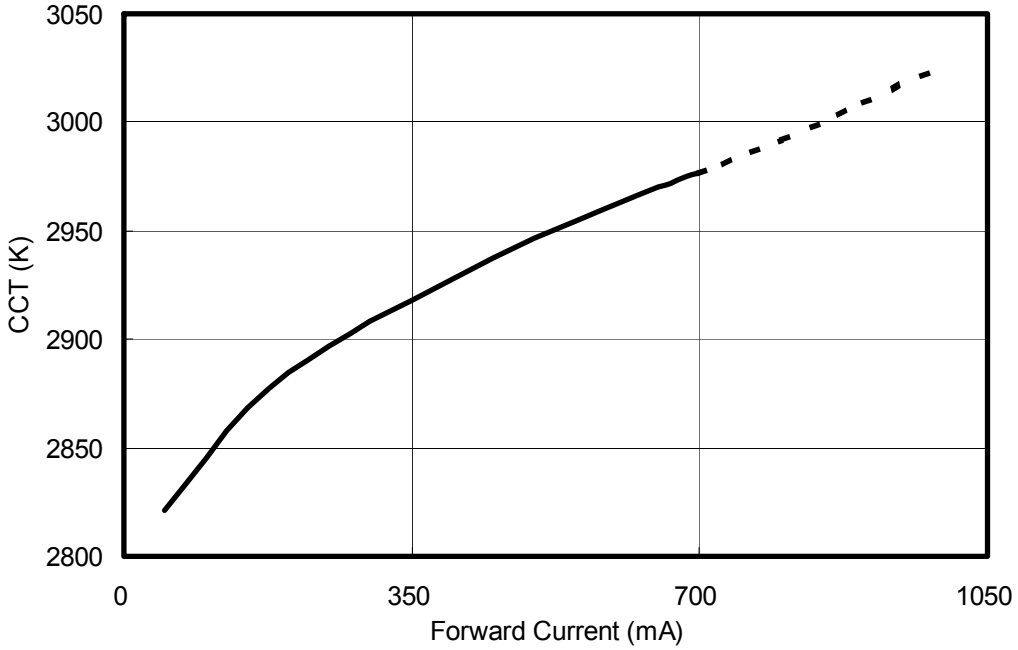
<Figure 21. Forward Current & Relative Luminous for 3W Edixeon® S series at T_J=25 >



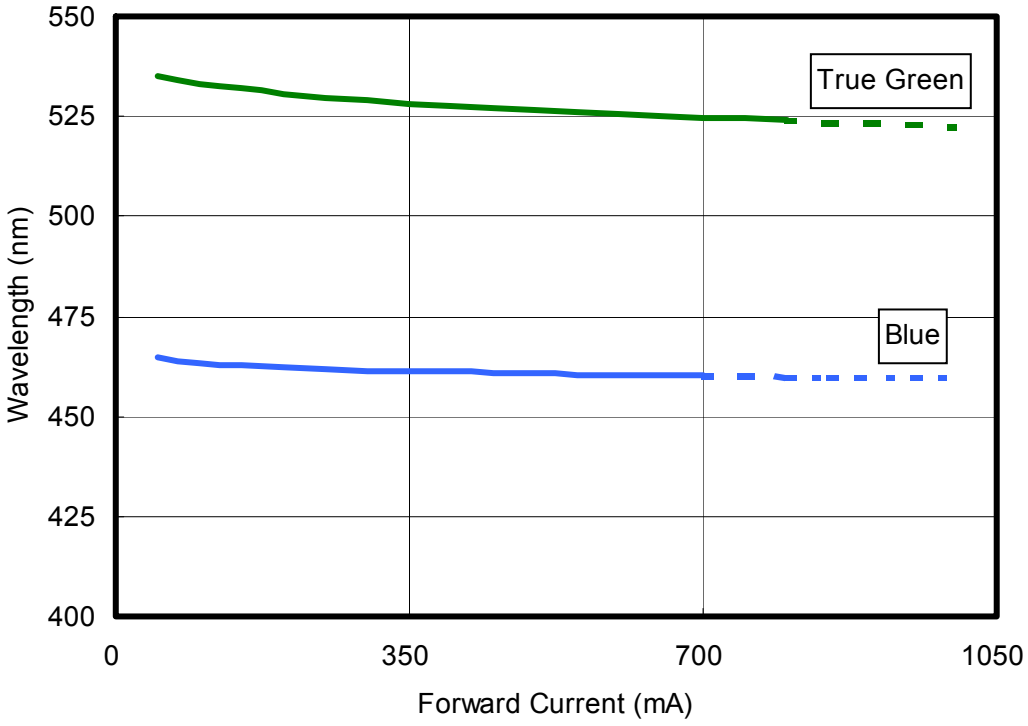
< Figure 22. Forward Current & CCT at T_J =25 for Edixeon® S series Cool White >



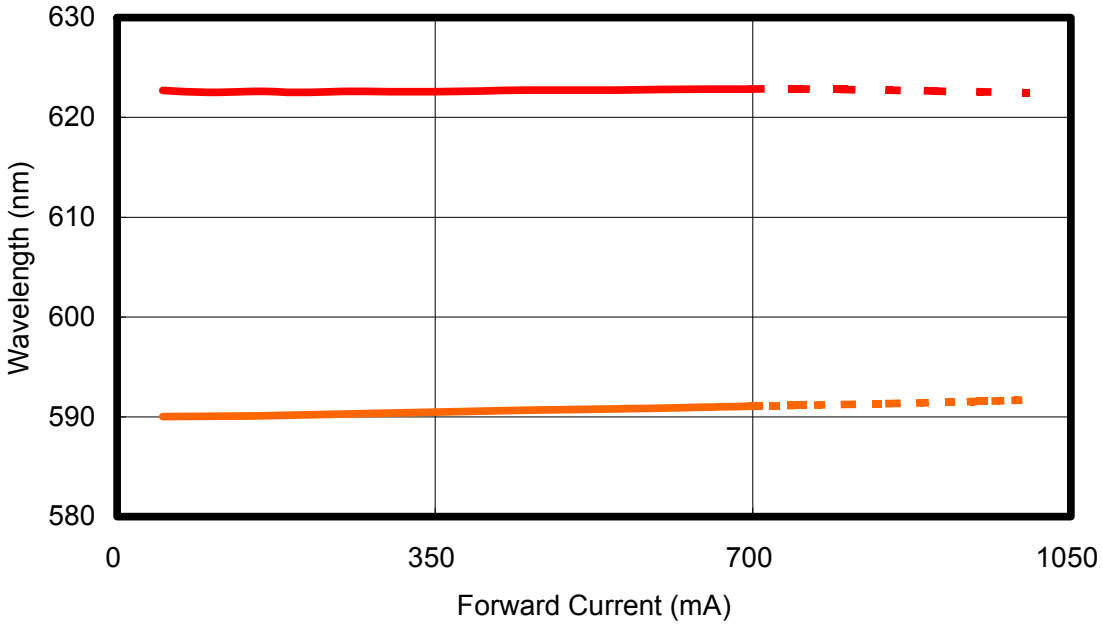
< Figure 23. Forward Current & CCT at T_J =25 for Edixeon® S series Neutral White >



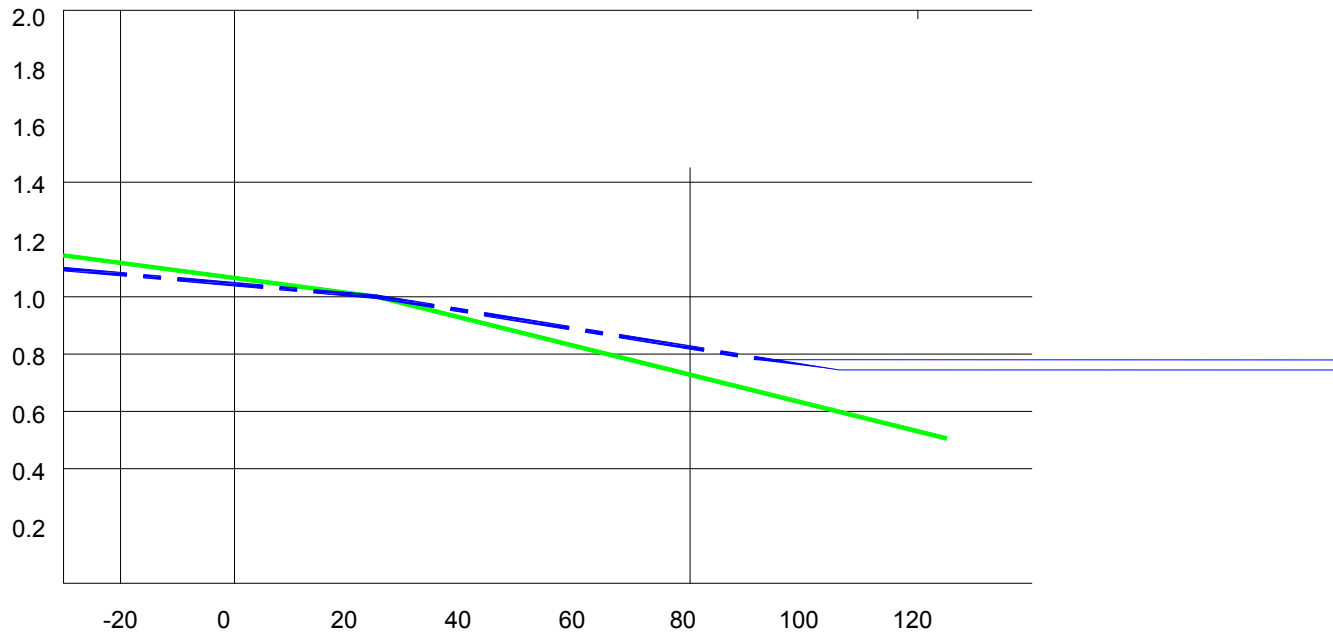
< Figure 24. Forward Current & CCT at T_J=25 for Edixeon® S series Warm White >



< Figure 25. Forward Current & Wavelength at T_J=25 for Edixeon® S series True Green and Blue>

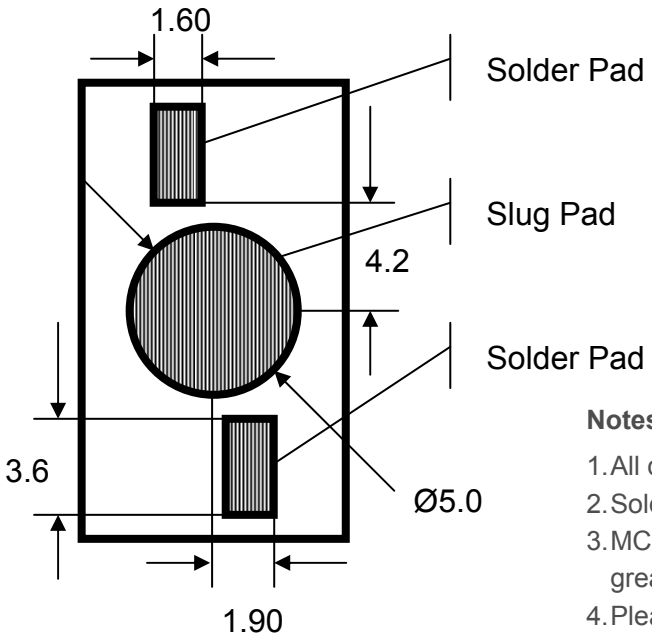


< Figure 26. Forward Current & Wavelength at T_J=25 for Edixeon® S series Red and Amber>



Product Soldering Instructions

The central circle pad at the bottom face of the package provides the main path for heat dissipation from the LED to the heat sink (heat sink contact).



< Figure 28. Pad dimensions >

Notes:

1. All dimensions are measured in mm.
2. Solder pad cannot be connected to slug pad.
3. MCPCB material with a thermal conductivity greater than 3.0 W/mK.
4. Please avoid touching the Edixeon® lens during assembly processes .This may cause pollution or scratch on the surface of lens.

The choice of solder and the application method will dictate the specific amount of solder. For most consistent results, an automated dispensing system or a solder stencil printer is recommended.

Positive results will be used solder thickness that results in 50μm. The lamp can be placed on the PCB simultaneously with any other required SMD and reflow completed in a single step. Automated pick-and-place tools are recommended.

The bottom of the slug, which is electrically connected to anode(+), provides the main path for heat dissipation from LED to the heat-sink.

Recommend Solder Steps

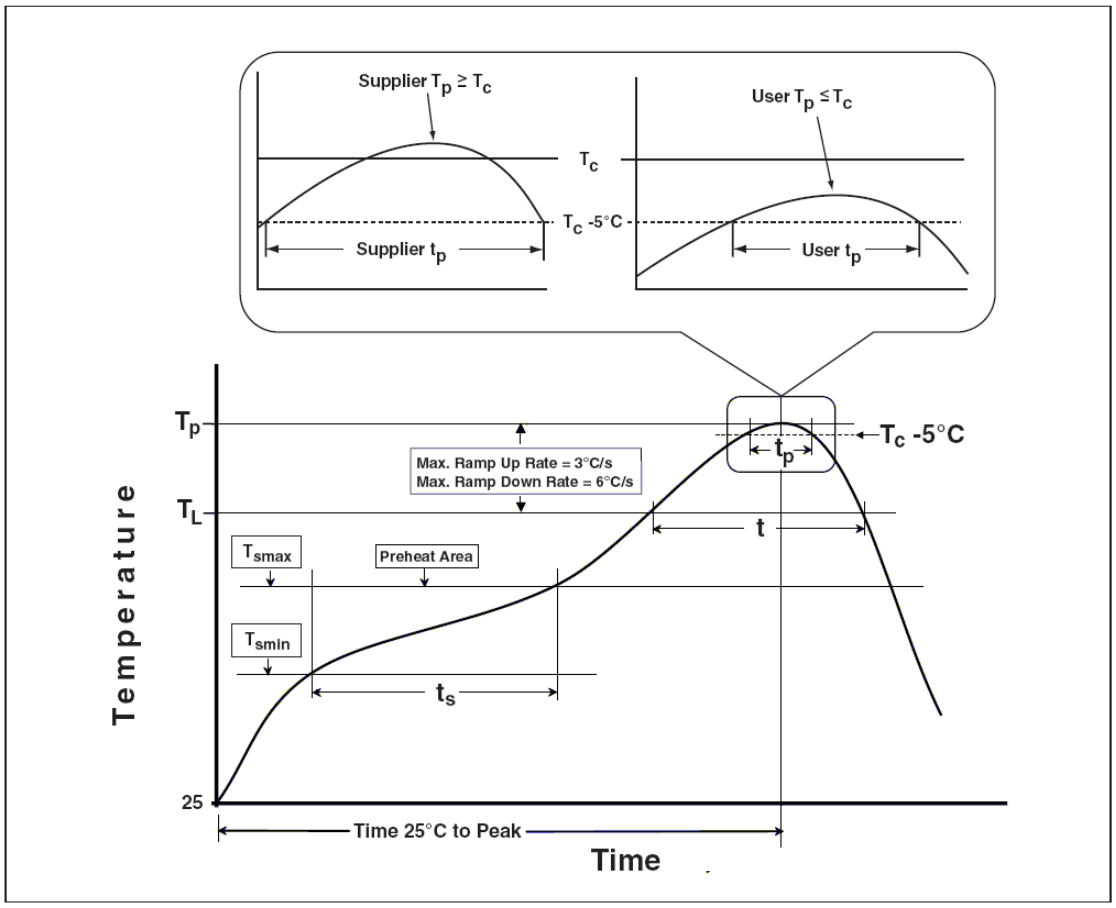
To prevent mechanical failure of LEDs in the soldering process, a carefully controlled pre-heat and post-cooling sequence is necessary. The heating rate in an IR furnace depends on the absorption coefficients of the material surfaces and on the ratio of the component's mass to its irradiated surface. The temperature of parts in an IR furnace, with a mixture of radiation and convection, cannot be determined in advance. Temperature measurement may be performed by measuring the temperature of a specific component while it is being transported through the furnace. Influencing parameters on the internal temperature of the component are as follows:

• Time and power
• Mass of the component (for Edixeon® S series on MCPCB)
• Size of the component
• Size of the printed circuit board
• Absorption coefficient of the surfaces and MCPCB
• Packing density

Peak temperatures can vary greatly across the PC board during IR processes. The variables that contribute to this wide temperature range include the furnace type and the size, mass and relative location of the components on the board. Profiles must be carefully tested to determine the hottest and coolest points on the board. The hottest and coolest points should fall within the recommended temperatures. The profile of the reflow system should be based on design needs, the selected solder system and the solder-paste manufacturer's recommended reflow profile.

Recommended Profile for Reflow Soldering

The following reflow soldering profiles are provided for reference. Edison recommends that users follow the recommended soldering profile provided by the manufacturer of the solder paste used.



< Figure 29. Reflow profiles >

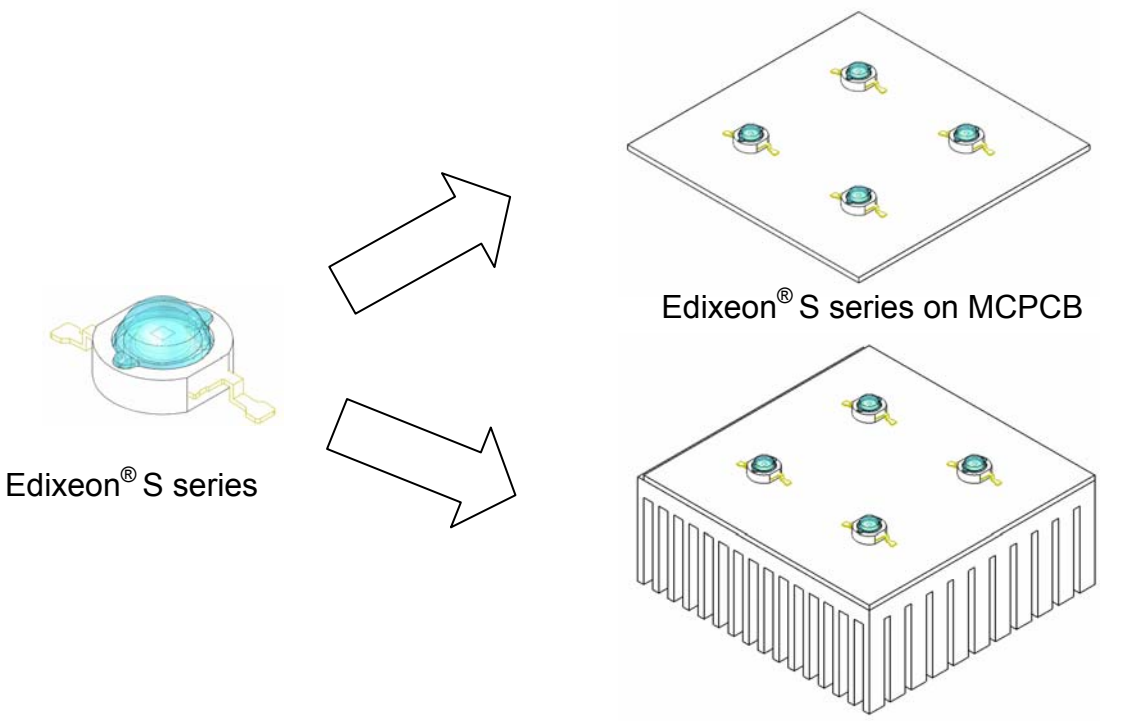
Table of Classification Reflow Profiles

< Table 15. Reflow profiles >

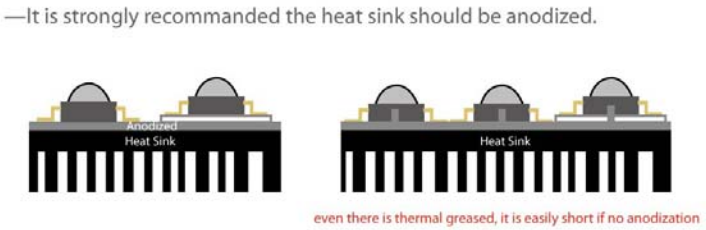
Profile Feature	Sn-Pb Eutectic Assembly	Pb-Free Assembly
Preheat & Soak Temperature min (Tsmin) Temperature max (Tsmax) Time (Tsmin to Tsmax) (ts)	100 °C 150 °C 60-120 seconds	150 °C 200 °C 60-120 seconds
Average ramp-up rate (Tsmax to Tp)	3 °C/second max.	3 °C/second max.
Liquidous temperature (TL) Time at liquidous (tL)	183 °C 60-150 seconds	217 °C 60-150 seconds
Peak package body temperature (Tp)*	230 °C ~235 °C *	255 °C ~260 °C *
Classification temperature (Tc)	235 °C	260 °C
Time (tp)** within 5 °C of the specified classification temperature (Tc)	20** seconds	30** seconds
Average ramp-down rate (Tp to Tsmax)	6 °C/second max.	6 °C/second max.
Time 25 °C to peak temperature	6 minutes max.	8 minutes max.
* Tolerance for peak profile temperature (Tp) is defined as a supplier minimum and a user maximum. ** Tolerance for time at peak profile temperature (tp) is defined as a supplier minimum and a user maximum.		

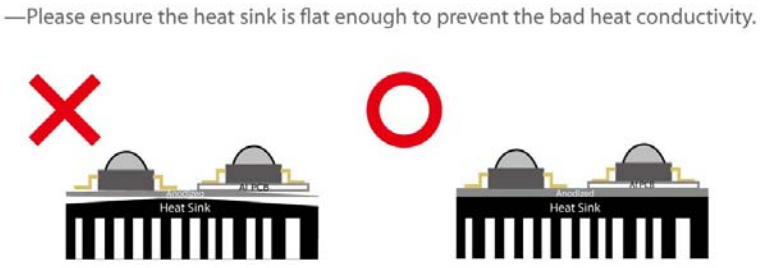
Product Thermal Application Information

Thermal grease should be evenly applied with a thickness <100um, when assembling on MCPCB or heat-sink carrier.



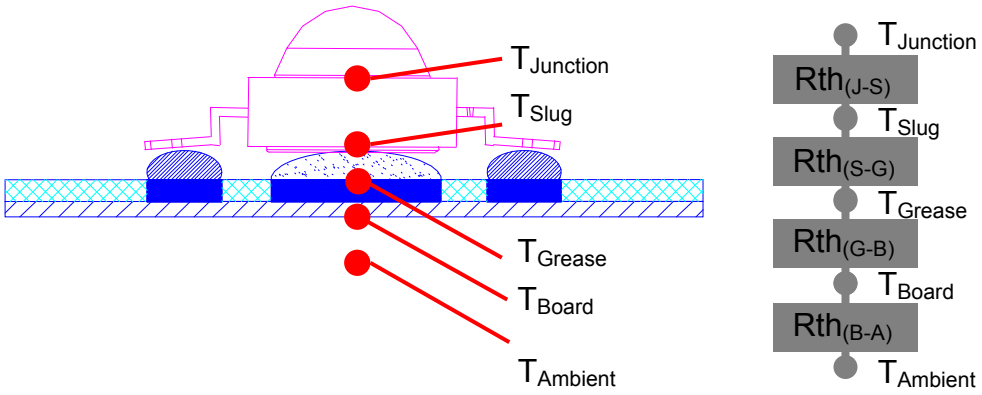
< Figure 30. Edixeon® S series heat-sink application >





<Figure 31. Edixeon® S series assemble with heat-sink>

Thermal Resistance Application



$Rth_{(J-A)} = Rth_{(J-S)} + Rth_{(S-G)} + Rth_{(G-B)} + Rth_{(B-A)}$

$T_{Junction} = T_{Ambient} + Rth_{(J-A)} \times P_{Dissipation}$

$(T_J = T_A + Rth_{(J-A)} \times P_{Dissipation})$

<Figure 32. Rth and T_J for Edixeon® S series >

Suggested Adhesive for Selection(such as thermal grease)

- Ease of use

  Non-solvent, One-part
- Fast tack free

  3 minutes at 25°C
- No corrosion

  Alcohol type of room temperature vulcanization (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

< Table 16. Specification for adhesive properties >

Specification	Suggested Properties
Take-free time	3~10 minutes
Specific gravity	< 3 g/cm^2
Thermal conductivity	> 2.5 W/mK
R_{TH} in using	< 1.8 °C/W
Volume resistance	> 1x10^{14}
Lap shear adhesion strength	> 200 N/ cm^2
Tensile strength	> 4 Mpa

Thermal Resistance Calculation

The thermal resistance between two points is defined as the ratio of the difference in temperature to the power dissipated. For calculations in the following units used are °C/W. In the case of LEDs, the resistance of two important thermal paths affects the junction temperature:

From the LED junction to the thermal contact at the bottom of the package, this thermal resistance is governed by the package design. It is referred to as the thermal resistance between junction and slug (Rth $_{(J-S)}$)

From the thermal contact to ambient conditions, this thermal resistance is defined by the path between the slug, board, and ambient. It is referred to as the thermal resistance between slug and board (Rth $_{(S-B)}$) and between board and ambient (Rth $_{(B-A)}$).

The overall thermal resistance between the LED junction and ambient (Rth $_{(J-A)}$) can be modeled as the sum of the series resistances Rth $_{(J-S)}$, Rth $_{(S-B)}$.,and Rth $_{(B-A)}$.

The following will show how to calculate Rth for each part of LED module.

1. Rth $_{(J-S)}$

Assume Edixeon® Rth $_{(J-S)}$=10 °C/W

2. Rth $_{(S-G)}$

If the thickness of thermal grease is 100um and area is $(6.4/2)^2\pi$ mm^2.

Thermal conductivity of thermal grease is 2.6 W/mK.

The Formula of Rth is $\dfrac{\text{Thickness(um)}}{\text{Thermal Conductivity (W/mK) x Area(mm}^2\text{)}}$

Therefore Rth $_{(S-G)}$= $\dfrac{100}{2.6 \text{ X } (6.4/2)^2\pi}$ = 1.2 °C/W

3. $Rth_{(G-B)}$

The Rth of standard MCPCB is 1.5 °C/W

4. $Rth_{(B-A)}$

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

Therefore $Rth_{(B-A)}$ $\frac{500}{Area(cm)^2}$

If Area is $30cm^2$ Rth =16.7 $Rth_{(J-A)}$ =10+1.2+1.5+16.7 =29.4 °C/W

If Area is $60cm^2$ Rth =8.3 $Rth_{(J-A)}$ =10+1.2+1.5+8.3 =21°C/W

If Area is $90cm^2$ Rth =5.5 $Rth_{(J-A)}$ =10+1.2+1.5+5.5 =18.2°C/W

Junction Temperature Calculation

The total power dissipated by the LED is the product of the forward voltage (V_F) and the forward current (I_F) of the LED.

The temperature of the LED junction is the sum of the ambient temperature and the product of the thermal resistance from junction to ambient and the power dissipated.

$T_{Junction} = T_{Air} + Rth_{(J-A)} \times P_{Dissipation}$

If one white Edixeon® in room temperature (25ºC) operated 350mA and V_F=3.3V,

the $P_{Dissipation}$=0.35 x 3.3=1.155W

And junction temperature is

$T_{Junction}$ = 25ºC+ 18.2 x 1.155 = 46.021ºC (total surface area =$90cm^2$)

$T_{Junction}$ = 25ºC+ 21 x 1.155 = 49.255 ºC (total surface area =$60cm^2$)

$T_{Junction}$ = 25ºC+ 29.4 x 1.155 = 58.957 ºC (total surface area =$30cm^2$)

Example : Junction Temperature Calculation

One white LED is used under ambient temperature ($T_{Ambient}$) of 30°C. This LED is soldered on MCPCB (Area=$10cm^2$). Calculate junction temperature.

Assuming a forward voltage of V_F=3.3V at 350mA and total power dissipated is

$P_{Dissipation}$=1x 0.35 x 3.3= 1.155 W.

$Rth_{(J-S)}$=10 °C /W.

With good design, $Rth_{(S-G)}$ can be minimized to 1 °C /W.

$Rth_{(G-B)}$ of a standard MCPCB can be 1.5 °C /W.

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

$\frac{500}{Area(cm)^2}$

Therefore it can be calculated in formula

$$Rth_{(B-A)} = \frac{500}{10} = 50\,^{\circ}C/W.$$

Following the formula $T_{Junction} = T_{Ambient} + Rth_{(J-A)} \times P_{Dissipation}$

$T_{Junction} = 30\,^{\circ}C + (10\,^{\circ}C/W + 1\,^{\circ}C/W + 1.5\,^{\circ}C/W + 50\,^{\circ}C/W) \times 1.155W$

$= 102.1875\,^{\circ}C$

That means this LED emitter is operated under good condition ($T_{Junction} < 125\,^{\circ}C$).

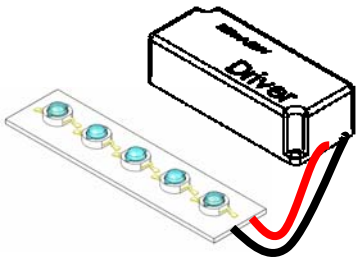
It's strongly recommended to keep the junction temperature under 125 ºC

Or keep the temperature of emitter lead not exceed 55 ºC

Product Electrical Application Information

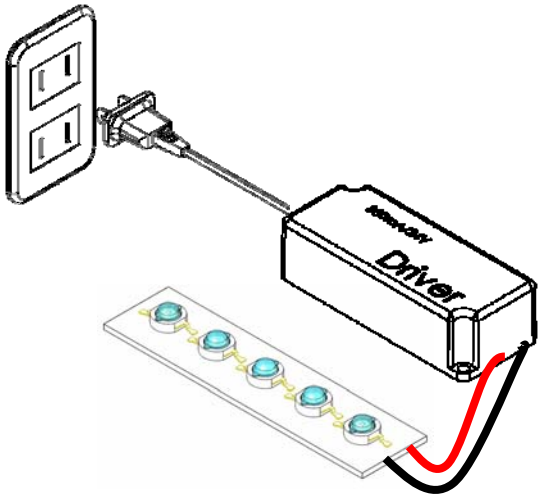
Following graphs and descriptions show how to connect LED or LED module and plug to AC outlet.

Step1: Connect the wires of LED Module to the DC output of the driver.



<Figure 33. LED Module connect to the DC output of the driver>

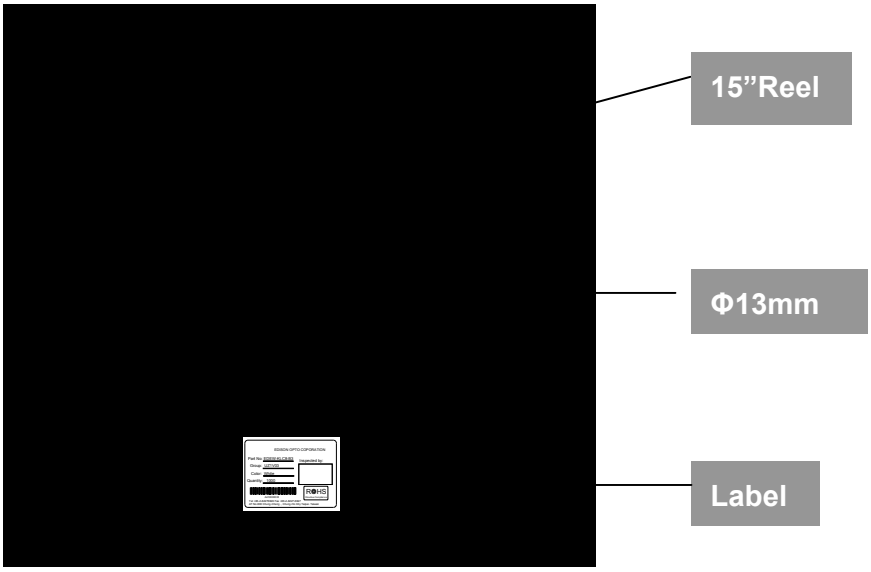
Step2 : Plug the driver to AC outlet.



<Figure 34. Plug the AC output of the driver to AC outlet>

Caution: Never plug the driver to AC outlet before the LED Module is properly connected as this may generate transient voltage damage the LEDs permanently with a short or open circuit.

Product Packaging Information



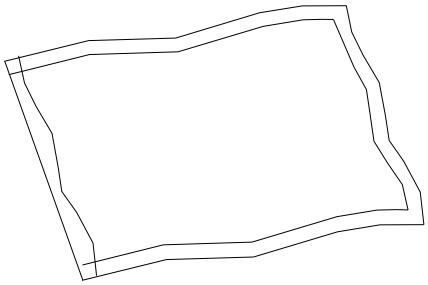
<Figure 35. Taping reel dimensions>

The Label

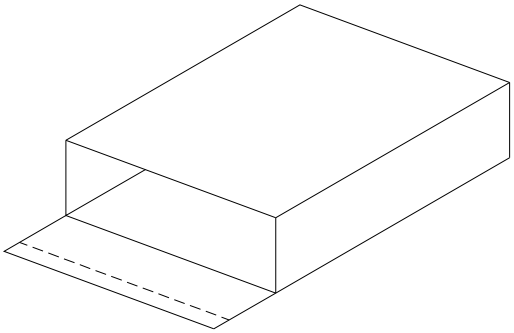


< Figure 36. Label on taping reel >

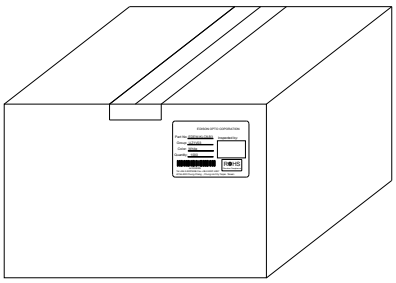
Packaging Steps



1 reel in a bag.



2 bags in an inner box.



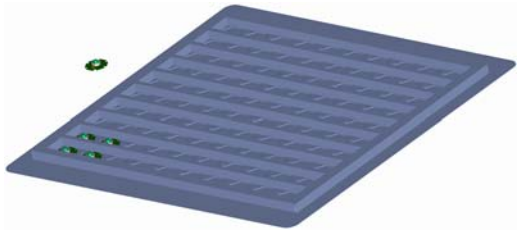
2 inner boxes in an outer box.

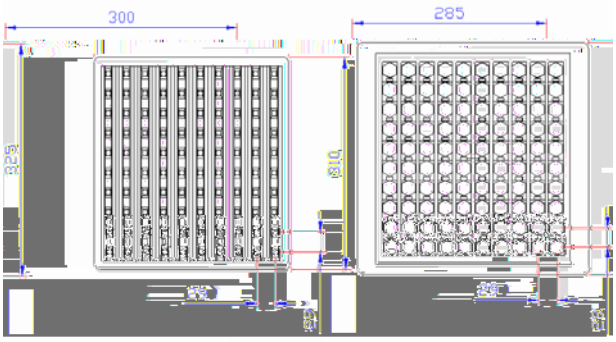
<Figure 37. Packaging steps>

Notes:

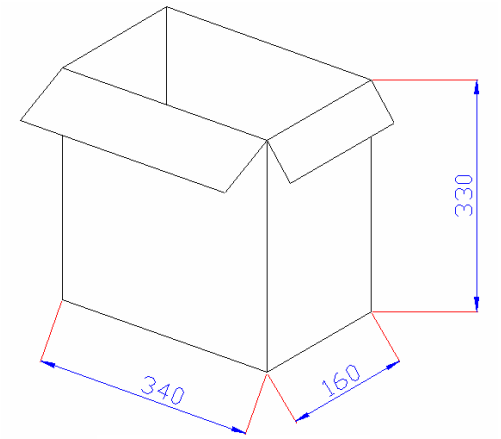
1. All dimensions are in mm.
2. There are 1000pcs emitters in a full reel.
3. There is one reel in a bag.
4. There are 2 bags in an inner box.
5. There are 2 inner boxes in an outer box.
6. A bag contains one humidity indicator card and drying agent.

Star Product Packaging Information

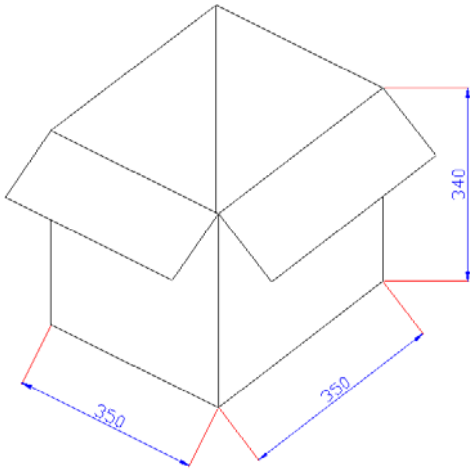




Tray Cover



Inner box

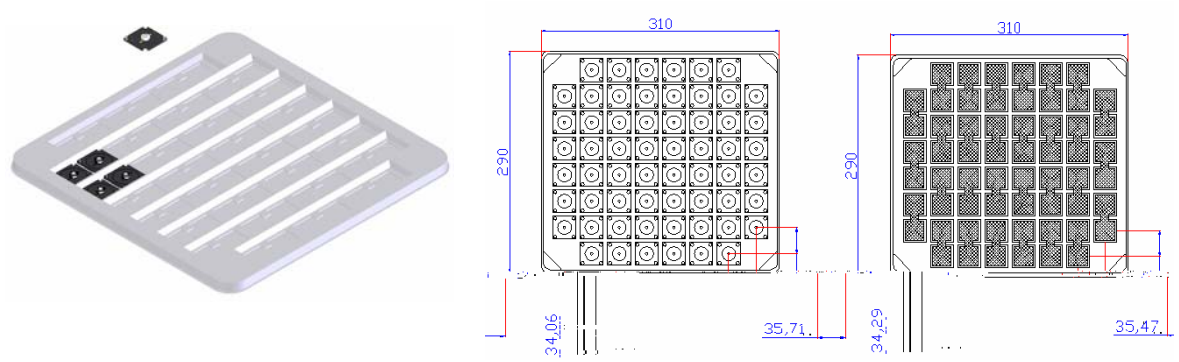


Outer box

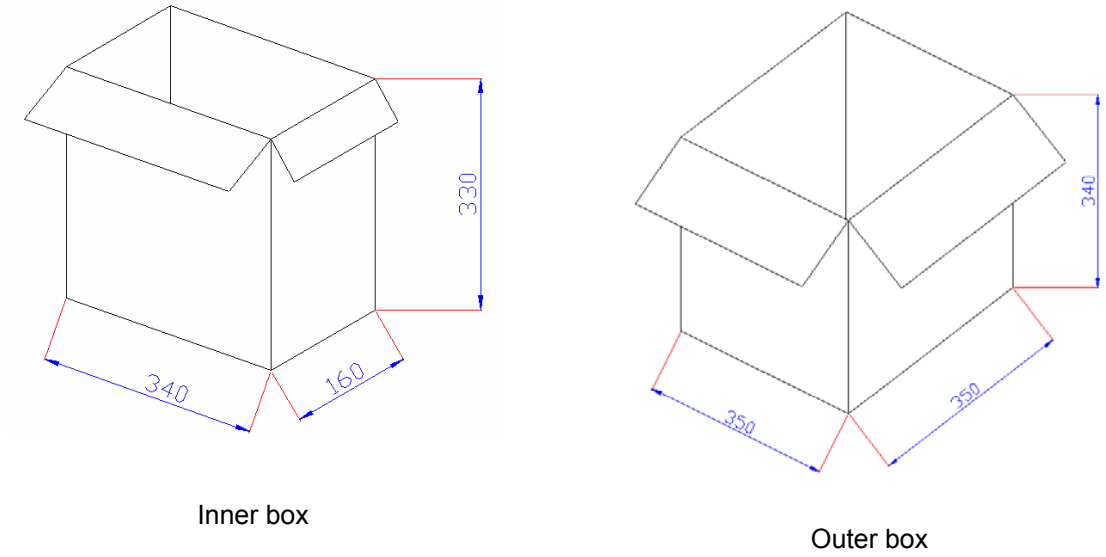
<Figure 38. Edixeon® Star Package>

Notes:

1. All dimensions are in mm.
2. There are 100pcs stars in a tray.(Tray+Cover)
3. There are 10 trays in an inner box.
4. There are 2 inner boxes in an outer box.



Tray Cover



Inner box Outer box

<Figure 39. Edixeon® Star Package>

Notes

1. All dimensions are in mm.
2. There are 60 pcs stars in a tray.(Tray+Cover)
3. There are 10 trays in an inner box.
4. There are 2 inner boxes in an outer box.