

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

Part Name	Color	$2\Theta_{1/2}(\text{Typ.})$			Units
		Lambertian	Batwing	Focusing	
EDEW-1xAx	White	130	110	80	Degrees
EDEW-1LA6	White	130	--	--	Degrees
EDEW-1LA7	White	120	--	--	Degrees
EDEX-1xAx	Warm White	130	110	80	Degrees
EDER-1xAx	Red	120	100	35	Degrees
EDEO-1xAx	Red Orange	120	100	35	Degrees
EDEA-1xAx	Amber	120	100	35	Degrees
EDET-1xAx	True Green	150	110	40	Degrees
EDEB-1xAx	Blue	150	110	40	Degrees
EDEC-1xAx	Royal Blue	150	110	40	Degrees

Part Name	Color	$\Theta_{\text{PEAK}}(\text{Typ.})$		Units
		Batwing	Side emitting	
EDEW-1xAx	White	$\pm 40$	$\pm 80$	Degrees
EDEW-1SA6	White	--	$\pm 80$	Degrees
EDEW-1SA7	White	--	$\pm 80$	Degrees
EDEX-1xAx	Warm White	$\pm 40$	$\pm 80$	Degrees
EDER-1xAx	Red	$\pm 35$	$\pm 80$	Degrees
EDEO-1xAx	Red Orange	$\pm 35$	$\pm 80$	Degrees
EDEA-1xAx	Amber	$\pm 35$	$\pm 80$	Degrees
EDET-1xAx	True Green	$\pm 40$	$\pm 80$	Degrees
EDEB-1xAx	Blue	$\pm 40$	$\pm 80$	Degrees
EDEC-1xAx	Royal Blue	$\pm 40$	$\pm 80$	Degrees

Note

1. Flux is measured with an accuracy of  $\pm 10\%$ .
2. CCT selection acc. to CCT groups and an accuracy of  $\pm 200\text{K}$
3. Forward Voltage is measured with an accuracy of  $\pm 0.1\text{V}$
4. Wavelength is measured with an accuracy of  $\pm 0.5\text{nm}$
5. All white - warm white - True green and blue emitters are built with InGaN
6. All red - red-orange and amber emitters are built with AlGaInP

### JEDEC Moisture Sensitivity:

Level	Floor Life		Soak Requirements			
	Time	Conditions	Standard Time (hours)	Standard Conditions	Accelerated Environment Time (Hours)	Accelerated Environment Conditions
4	72hours	$\leq 30^{\circ}\text{C} / 60\% \text{RH}$	96 $\pm 2/-0$	30°C / 60% RH	20 $\pm 0.5/-0$	60°C / 60% RH

LEVEL	FLOOR LIFE		SOAK REQUIREMENTS			
			STANDARD		ACCELERATED EQUIVALENT <sup>1</sup>	
	TIME	CONDITIONS	TIME (hours)	CONDITIONS	TIME (hours)	CONDITIONS
1	Unlimited	$\leq 30^{\circ}\text{C}/85\% \text{RH}$	168 $\pm 5/-0$	85°C/85% RH		
2	1 year	$\leq 30^{\circ}\text{C}/80\% \text{RH}$	168 $\pm 5/-0$	85°C/80% RH		
2a	4 weeks	$\leq 30^{\circ}\text{C}/80\% \text{RH}$	696 <sup>2</sup> $\pm 5/-0$	30°C/80% RH	120 $\pm 1/-0$	60°C/80% RH
3	168 hours	$\leq 30^{\circ}\text{C}/80\% \text{RH}$	168 <sup>2</sup> $\pm 5/-0$	30°C/80% RH	40 $\pm 1/-0$	60°C/80% RH
4	72 hours	$\leq 30^{\circ}\text{C}/80\% \text{RH}$	96 <sup>2</sup> $\pm 2/-0$	30°C/80% RH	20 $\pm 0.5/-0$	60°C/80% RH
5	48 hours	$\leq 30^{\circ}\text{C}/80\% \text{RH}$	72 <sup>2</sup> $\pm 2/-0$	30°C/80% RH	15 $\pm 0.5/-0$	60°C/80% RH
5a	24 hours	$\leq 30^{\circ}\text{C}/80\% \text{RH}$	48 <sup>2</sup> $\pm 2/-0$	30°C/80% RH	10 $\pm 0.5/-0$	60°C/80% RH
6	Time on Label (TOL)	$\leq 30^{\circ}\text{C}/80\% \text{RH}$	TOL	30°C/80% RH		

Note 1. The standard soak time includes a default value of 24 hours for semiconductor manufacturer's exposure time (MET) between bake and bag and includes the maximum time allowed out of the bag at the distributor's facility.

### Operating life, mechanical, and environmental tests performed on Edixeon<sup>®</sup> package:

Stress Test	Stress Conditions	Pass Point(s)	Failure Criteria
Room Temperature Operating Life	25°C, I <sub>F</sub> = max DC (Note 1)	1000 hours	Note 2
High Temperature High Humidity	85°C / 85%RH	1000 hours	Note 2
Temperature Cycle	-40°C/100°C, 30 min dwell / < 5min transfer	200 cycles	Note 2
High Temperature Storage Life	110°C	1000 hours	Note 2
Low Temperature Storage Life	-55°C	1000 hours	Note 2
Thermal Shock	-40 / 120°C, 20 min dwell / < 20 sec transfer	200 cycles	No catastrophics
Mechanical Shock	1500 G, 0.5 msec pulse, 5 shocks each 6 axis		No catastrophics
Natural Drop	On concrete from 1.2 m, 3X		No catastrophics
Variable Vibration Frequency	10-2000-10 Hz, log or linear sweep rate, 20 G about 1 min, 1.5 mm, 3X/axis		No catastrophics
Solder Heat Resistance (SHR)	260°C $\pm$ 5°C, 10 sec		No catastrophics
Solderability	Steam age for 16 hr, then solder dip at 260°C for 5 sec		Solder coverage on lead

#### Note

1. Depending on the maximum derating curve.

2. Failure Criteria:

Electrical failures V<sub>F</sub> shift  $\geq$  10% I<sub>B</sub> < 50 $\mu$ A @ V<sub>R</sub> = 5V

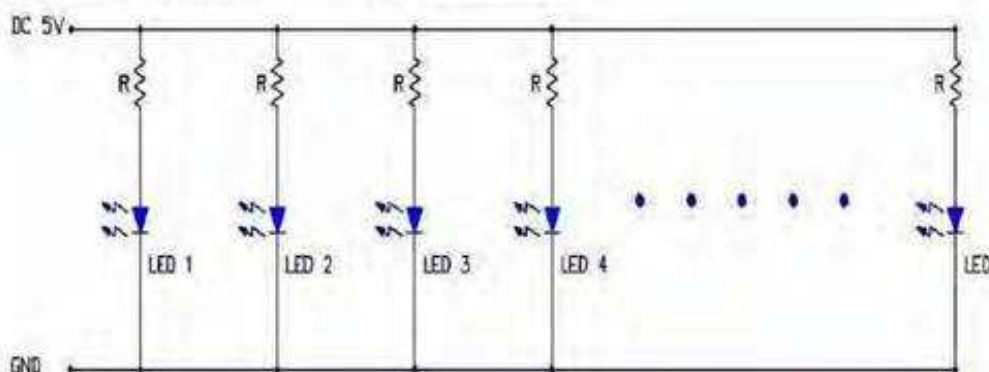
Light Output Degradation % I<sub>v</sub> shift  $\geq$  30% @ 1,000hrs or 200cycle

Visual failures Broken or damaged package or lead

Solderability < 95% wetting

Dimension out of tolerance

## Burn-in Condition Edixeon® Reliability



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

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

Life means the time light output becomes 70%.

T <sub>j</sub> (°C)	Life (hours)	T <sub>j</sub> (°C)	Life (hours)
25	234,000	85	29,500
30	191,000	90	25,700
35	157,000	95	22,300
40	129,000	100	19,500
45	107,000	105	17,100
50	90,000	110	15,100
55	75,000	115	13,300
60	64,000	120	11,700
65	54,000	125	10,500
70	46,000	130	9,300
75	39,600	140	7,500
80	34,000	150	6,000

When we talk about MTTF of Edixeon<sup>®</sup>, we can provide a formula for customers\_

MTTF is assumed to be 100,000,000

The failure rates at different hours and different systems(LED quantity) are as below:

if there is 1 failure of 1 emitter in a system

Tj=75°C is giving 0.01%(100ppm) at 10,000hrs

if there is 1 failure of 10 emitters in a system

Tj=75°C is giving 0.1%(1,000ppm) at 10,000hrs

if there is 1 failure of 1 emitter in a system

Tj=75°C is giving 0.05%(500ppm) at 50,000hrs

if there is 1 failure of 10 emitters in a system

Tj=75°C is giving 0.5%(5,000ppm) at 50,000hrs if there are 10 emitters

### How to Know Tj in Your Application?

If it is white Edixeon<sup>®</sup>, Rth(junction to case)=15°C/W

The thermal grease is 200um.

K(Aluminum PCB)=2.6 W/mk

Then Rth(case to board) =  $\frac{200}{2.6 \times (6.4/2)^2 \pi}$  = 2.4 °C/W

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

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

If Area is 30cm<sup>2</sup> Rth=16.7 ΔT(junction-air)=(15+2.4+16.7)x1=34.1 °C

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

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

### ASSIST FORM about High Power LED Reliability(White Edixeon<sup>®</sup>)

	Ts=45°C	Ts=65°C	Ts=85°C
Voltage	3.5V	3.5V	3.5V
Current	350mA	350mA	350mA
Wattage	1.2W	1.2W	1.2W
Heat	1.0W	1.0W	1.0W
Rth	15 °C/W	15 °C/W	15 °C/W
Tj	60 °C	80 °C	100 °C
L70%	64,000hrs	34,000hrs	19,500hrs