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## Contact us

Tel: +86-755-8981 8866 Fax: +86-755-8427 6832

Email & Skype: info@chipsmall.com Web: www.chipsmall.com

Address: A1208, Overseas Decoration Building, #122 Zhenhua RD., Futian, Shenzhen, China



## LOPL-E011M

### Datasheet of 1W Warm White Power LED

(Preliminary)



SPEC NO: \_\_\_\_\_

CREATED: Jan 13, 2006

REV. NO: 0.4

## 1. Description

The LOPL (LiteOn Power LED) Emitter I is a 1W power LED package which is a point light source with more energy efficient than incandescent and halogen lamps. It gives you total design freedom and unmatched brightness, creating a new opportunities for solid state lighting to displace conventional lighting technologies.

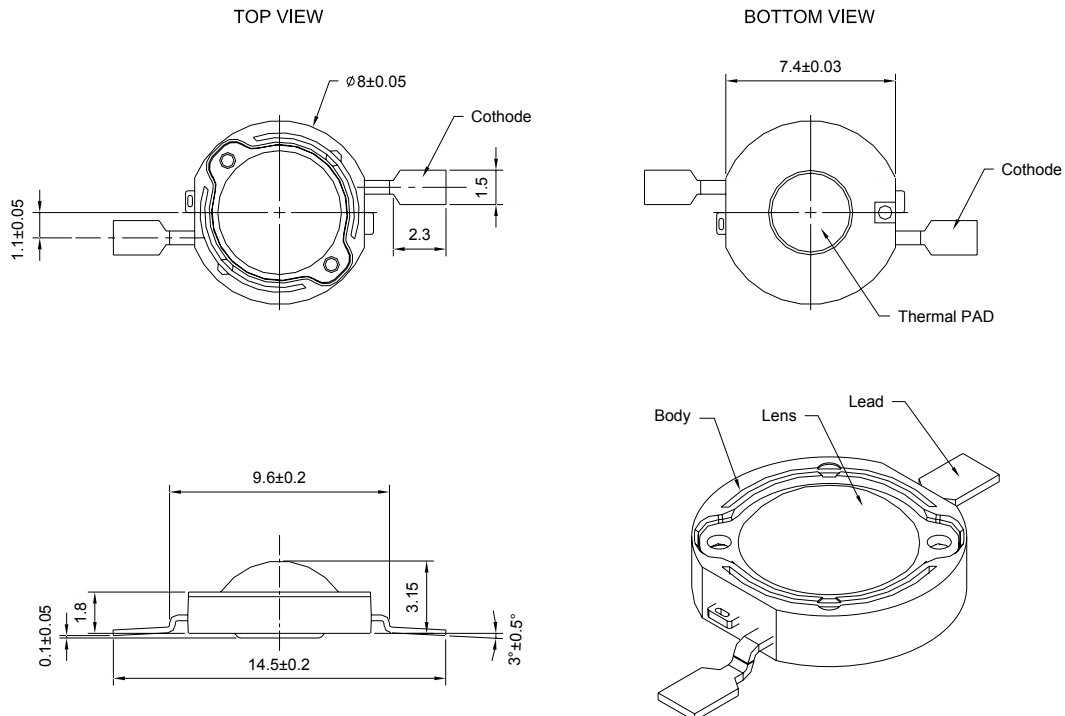
### Features

- High power LED light source
- Long life, up to 100k hours
- Instant light (less than 100 ns)
- Low voltage DC operated
- 110° Lambertian radiation pattern.
- Low thermal resistance

### Applications

- Portable lights
- Traffic signaling
- Backlighting
- Interior & exterior automotive lighting
- Decorative and landscape lighting
- Medical illumination

## 2. Outline Dimensions



### Notes

1. All dimensions are in millimeters.
2. Tolerance is  $\pm 0.2$  mm (.008") unless otherwise noted.

## 3. Rating and Characteristics

### 3.1 Absolute Maximum Ratings at Ta=25°C

Parameter	Symbol	Rating	Unit
Power Dissipation	$P_o$	1.5	W
Forward Current	$I_F$	350	mA
Forward Pulse Current	$I_{FP}$	500	mA
Reverse Voltage	$V_R$	5	V
Junction Temperature	$T_j$	125	°C
Thermal Resistance, Junction-Case	$R_{th, J-C}$	15	°C/W
Operating Temperature Range	$T_{opr}$	-40 - 80	°C
Storage Temperature Range	$T_{stg}$	-40 - 120	°C
Soldering Condition <sup>1, 2</sup>	$T_{sol}$	260°C For 5 Seconds	

#### Notes

1. Proper current derating must be observed to maintain junction temperature below the maximum. For more information, consult the LOPL Emitters application notes, available upon request.
2. Measured at leads, during lead soldering and heat pad attach, body temperature must not exceed 120°C. LOPL Emitters can't be soldered by general IR or Vapor phase reflow, nor by wave soldering. Lead soldering is limited to selective heating of the leads, such as by hot bar reflow or hand soldering.

## 3.2 Electro-Optical Characteristics at Ta=25°C

Parameter	Symbol	MIN.	TYP.	MAX.	Test Condition	Unit
Forward Voltage	$V_F$	3.03	3.80	4.23	$I_F = 350\text{mA}$	V
Reverse Current	$I_R$			100	$V_R = 5\text{V}$	$\mu\text{A}$
Luminous Flux <sup>1,4</sup>	$\Phi_V$	23.5	35		$I_F = 350\text{mA}$	lm
Color Rendering Index	CRI		80		$I_F = 350\text{mA}$	%
Viewing Angle <sup>2</sup>	$2\theta_{1/2}$		110		$I_F = 350\text{mA}$	°
Chromaticity Coordinates <sup>3,4</sup>	x		0.405		$I_F = 350\text{mA}$	
	y		0.391			
Temperature Coefficient of Chromaticity Coordinates <sup>3,4</sup>	$TC_x$		-0.1		$I_F = 350\text{mA}, T_{opr}$	$10^{-3}/^\circ\text{C}$
	$TC_y$		-0.2			
Temperature Coefficient of $V_F$	$TC_V$		-2.0		$I_F = 350\text{mA}, T_{opr}$	$\text{mV}/^\circ\text{C}$
Optical Efficiency	$\eta_{opt}$		26.3		$I_F = 350\text{mA}$	lm/W

### Notes

1. Luminous flux is the total luminous flux output as measured with an integrating sphere.
2. Viewing angle is the off-axis angle at which the luminous intensity is half the axial luminous intensity.
3. The chromaticity coordinates (x, y) is derived from the CIE 1931 chromaticity diagram.
4. IS CAS140B is for the luminous flux (lm) and the CIE1931 chromaticity coordinates (x, y) testing. The chromaticity coordinates (x, y) guarantee should be added  $\pm 0.01$  tolerance.

### 3.3 Typical Electrical / Optical Characteristics Curves

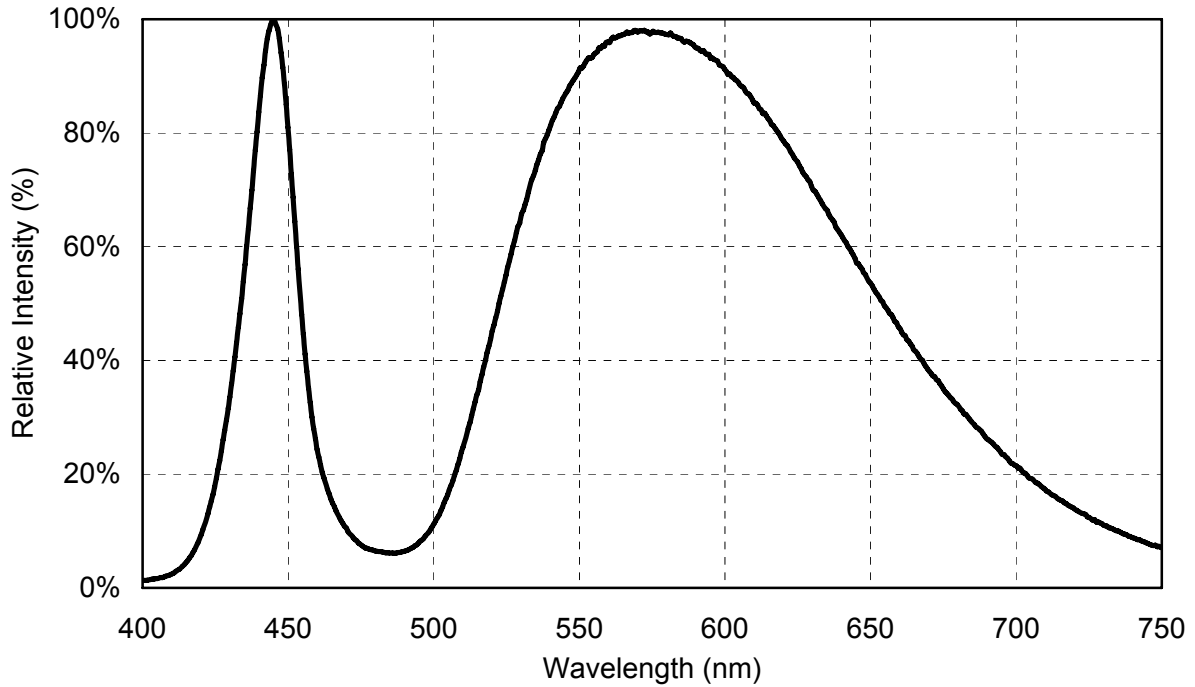


Fig 1. Relative Spectrum of Emission

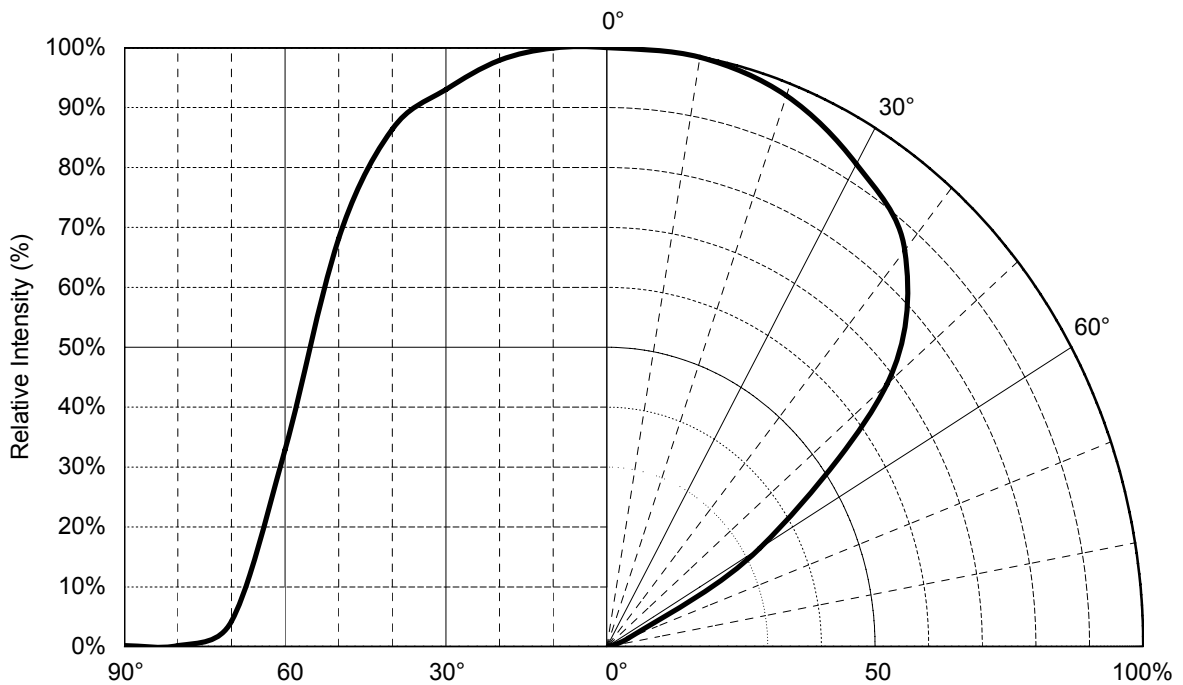


Fig 2. Radiation Characteristics

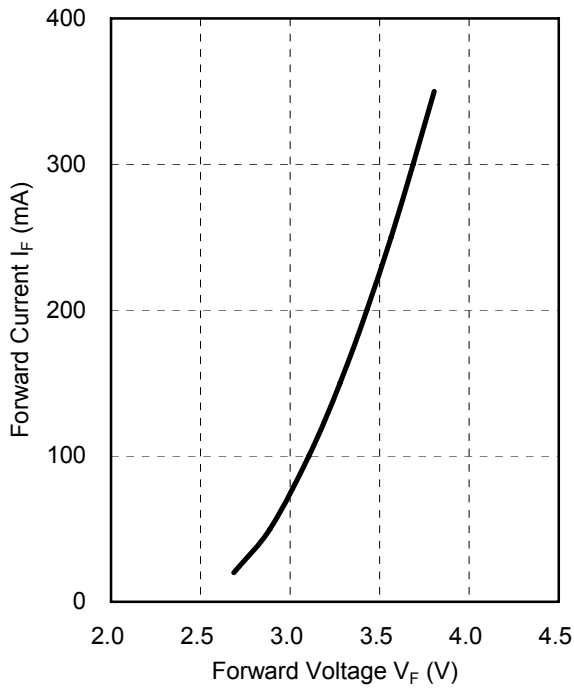


Fig 3. Forward Current

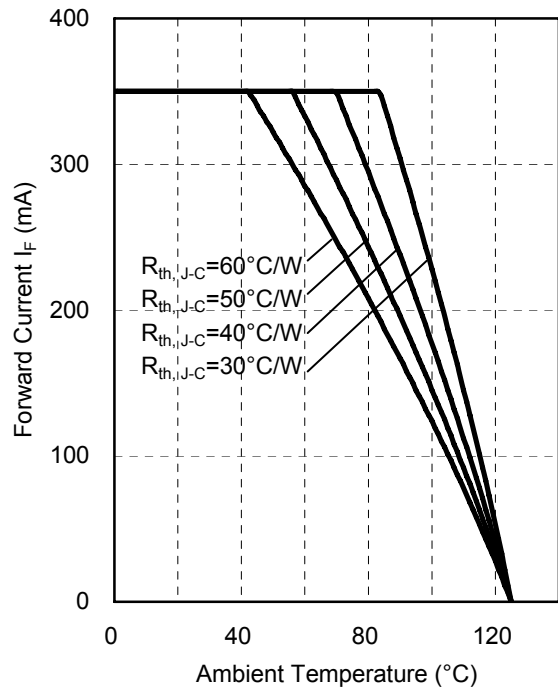


Fig 4. Forward Current Derating Curve

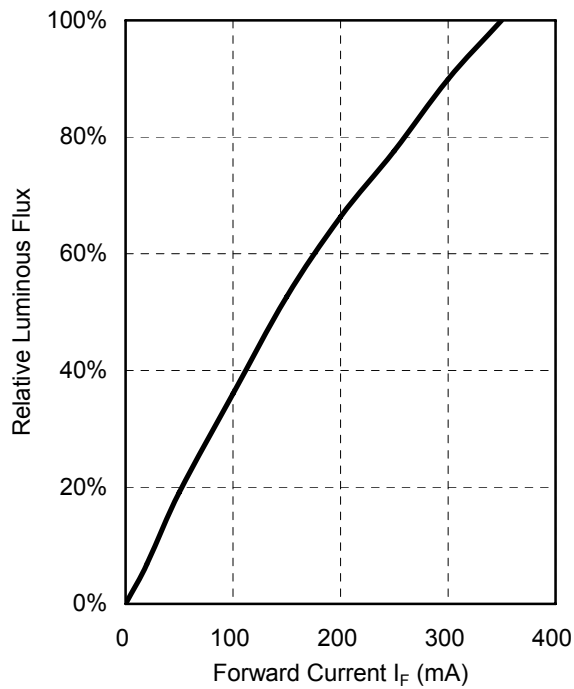


Fig 5. Relative Luminous Flux

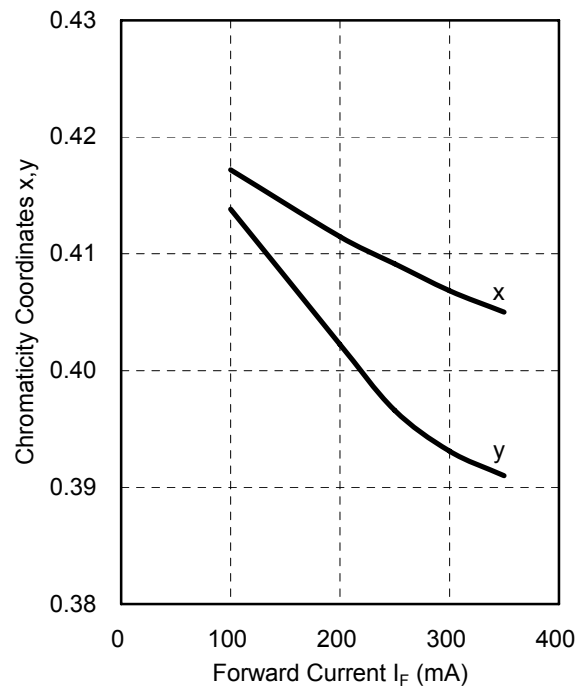
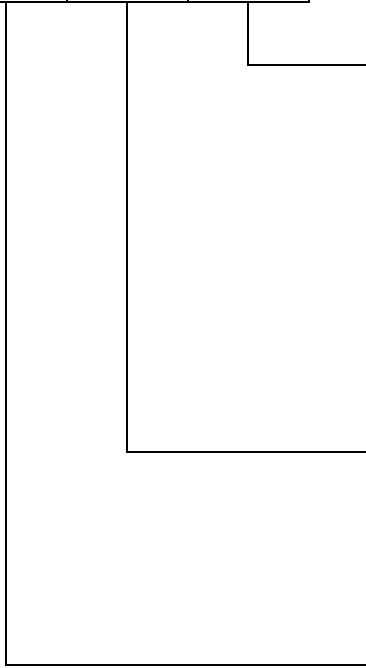


Fig 6. Chromaticity Coordinate Shift

## 4. Category Code Table

R	L	W1
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### Chromaticity Coordinate Categories

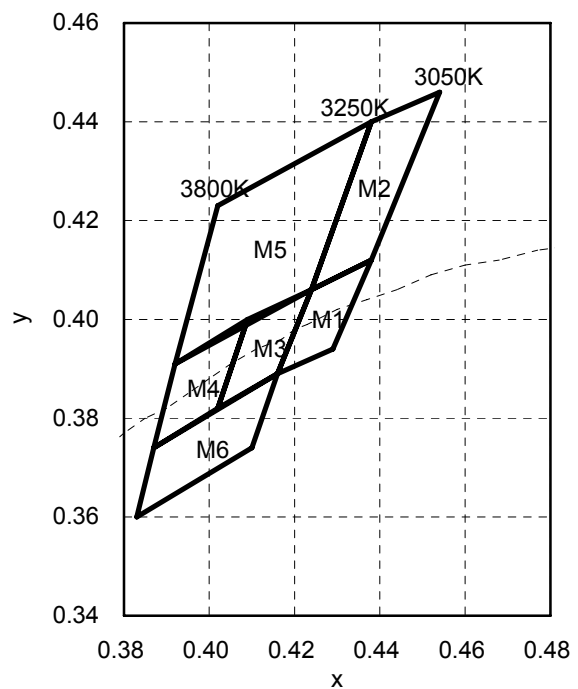
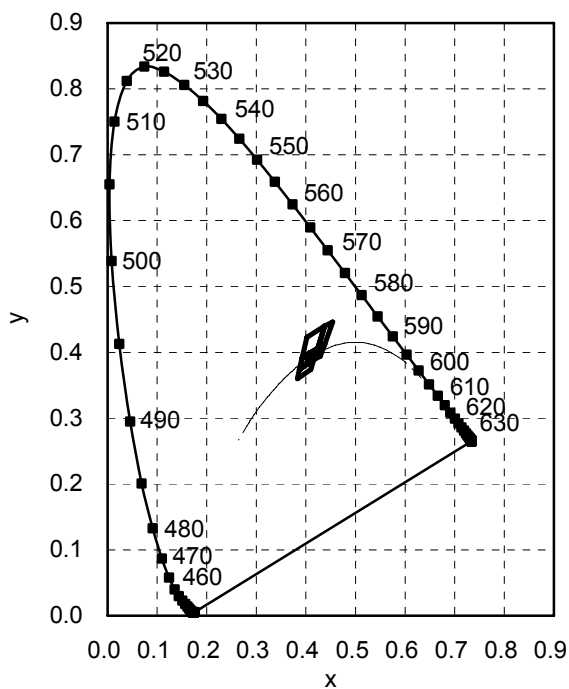
Code	x	y	Code	x	y
M1	0.424	0.406	M2	0.438	0.440
	0.416	0.389		0.424	0.406
	0.429	0.394		0.438	0.412
	0.438	0.412		0.454	0.446
M3	0.409	0.400	M4	0.392	0.391
	0.402	0.382		0.387	0.374
	0.416	0.389		0.402	0.382
	0.424	0.406		0.409	0.400
M5	0.402	0.423	M6	0.387	0.374
	0.392	0.391		0.383	0.360
	0.424	0.406		0.410	0.374
	0.438	0.440		0.416	0.389

### Forward Voltage Categories

Code	Min	Max
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

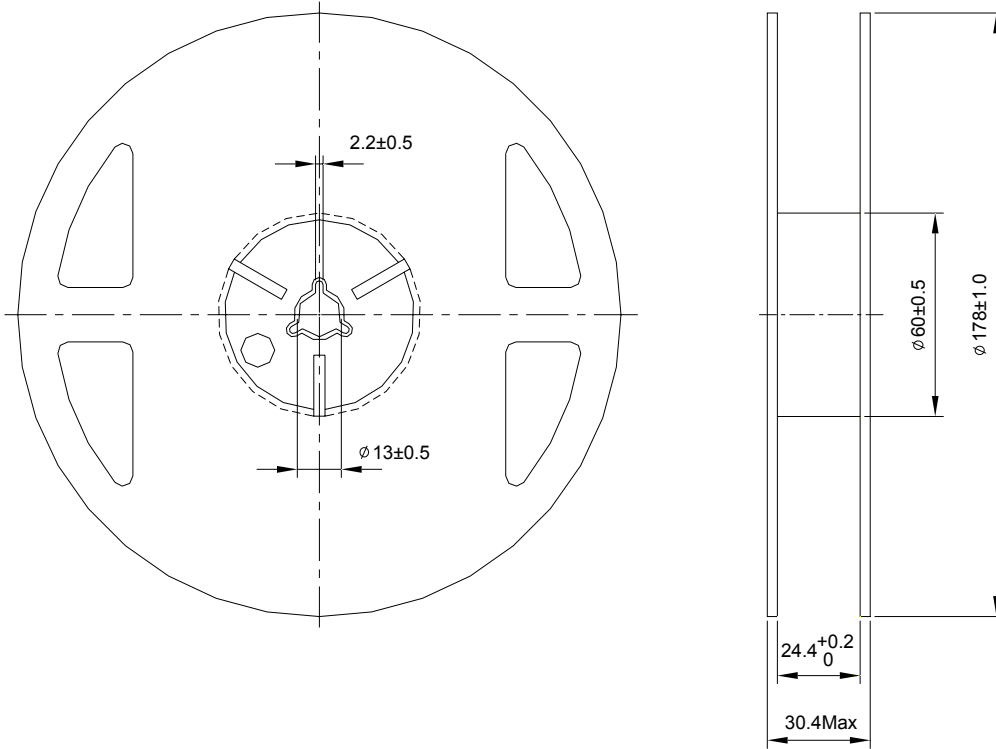
### Luminous Flux Categories

Code	Min	Max
P	23.5	30.6
Q	30.6	39.8
R	39.8	51.7

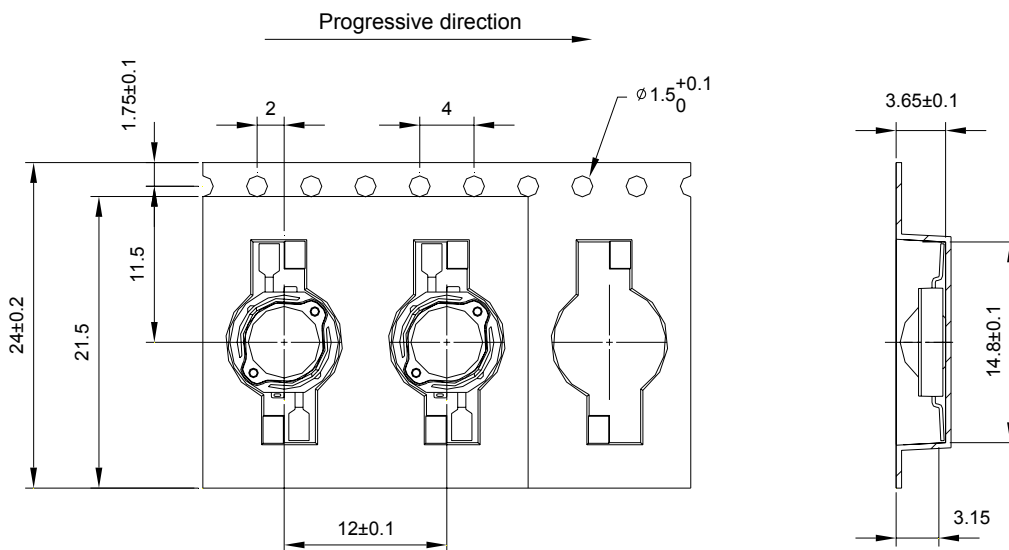




## 5. Package Dimensions of Tape and Reel



Note: The tolerances unless mentioned is  $\pm 0.1$ mm, Unit=mm



## 6. Reliability Test

Item	Description	Stress Condition	Test Duration
HTOL	High Temperature Operation Life	85°C, Max. I <sub>F</sub>	1000 hours
RTOL	Room Temperature Operation Life	25°C, Max. I <sub>F</sub>	1000 hours
LTOL	Low Temperature Operation Life	-40°C, Max. I <sub>F</sub>	1000 hours
WHTOL	Wet High Temperature Operation Life	85°C/60%RH, Max. I <sub>F</sub>	1000 hours
TC	Temperature Cycling	40/110°C, 30min dwell, <5min trans.	200 cycles
TS	Thermal Shock	-40/110°C 20min dwell, <20sec trans.	200 cycles
HTSL	High Temperature Storage Life	110°C	1000 hours
LTSL	Low Temperature Storage Life	-40°C	1000 hours
SHR	Solder Heat Resistance	260±5°C, 10secs	
SLD	Solderability	Steam age for 16 hrs, then solder dip at 245°C for 5secs	
SA	Salt Atmosphere	35°C	48 hours
MS	Mechanical Shock	1500G, 0.5msec pulse, 5 shocks each 6 axis	
ND	Natural Drop	On concrete from 1.2m, 3xtimes	
RV	Random Vibration	6G RMS from 10 to 2KHz, 10mins/axis	
VVF	Variable Vibration Frequency	10-2000-10Hz, 20G, 1 min, 1.5mm, 3timesx/axis	
LS	Lead Strength	1lb, 30 secs	
LF	Lead Fatigue	1lb, 3X45° bend	

## 7. Cautions

### 7.1 Application

The LEDs described here are intended to be used for ordinary electronic equipment (such as office equipment, communication equipment and household applications). Consult Liteon's Sales in advance for information on applications in which exceptional reliability is required, particularly when the failure or malfunction of the LEDs may directly jeopardize life or health (such as in aviation, transportation, traffic control equipment, medical and life support systems and safety devices).

### 7.2 Storage

The storage ambient for the LEDs should not exceed 30°C temperature or 70% relative humidity.

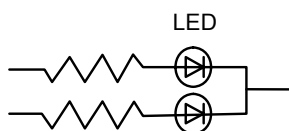
It is recommended that LEDs out of their original packaging are IR-reflowed within one week.

For extended storage out of their original packaging, it is recommended that the LEDs be stored in a sealed container with appropriate desiccant, or in a desiccators with nitrogen ambient.

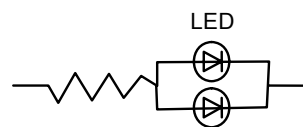
LEDs stored out of their original packaging for more than a week should be baked at about 60 deg C for at least 24 hours before solder assembly.

### 7.3 Drive Method

An LED is a current-operated device. In order to ensure intensity uniformity on multiple LEDs connected in parallel in an application, it is recommended that a current limiting resistor be incorporated in the drive circuit, in series with each LED as shown in Circuit A below.



Circuit model A



Circuit model B

(A) Recommended circuit.

(B) The brightness of each LED might appear different due to the differences in the I-V characteristics of those LEDs.

## 7.4 ESD (Electrostatic Discharge)

Static Electricity or power surge will damage the LED. Suggestions to prevent ESD damage:

- Use a conductive wrist band or anti-electrostatic glove when handling these LEDs.
- All devices, equipment, and machinery must be properly grounded.
- Work tables, storage racks, etc. should be properly grounded.
- Use ion blower to neutralize the static charge which might have built up on surface of the LED's plastic lens as a result of friction between LEDs during storage and handling.

ESD-damaged LEDs will exhibit abnormal characteristics such as high reverse leakage current, low forward voltage, or "no light up" at low currents. To verify for ESD damage, check for "light up" and  $V_F$  of the suspect LEDs at low currents. The  $V_F$  of "good" LEDs should be  $>2.0V@0.1mA$  for InGaN product.

## 7.5 Suggested Checking List

### Training and Certification

1. Everyone working in a static-safe area is ESD-certified?
2. Training records kept and re-certification dates monitored?

### Static-Safe Workstation & Work Areas

1. Static-safe workstation or work-areas have ESD signs?
2. All surfaces and objects at all static-safe workstation and within 1 ft measure less than 100V?
3. All ionizer activated, positioned towards the units?
4. Each work surface mats grounding is good?

### Personnel Grounding

1. Every person (including visitors) handling ESD sensitive (ESDS) items wear wrist strap, heel strap or conductive shoes with conductive flooring?
2. If conductive footwear used, conductive flooring also present where operator stand or walk?
3. Garments, hairs or anything closer than 1 ft to ESD items measure less than 100V?
4. Every wrist strap or heel strap/conductive shoes checked daily and result recorded for all DLs?
5. All wrist strap or heel strap checkers calibration up to date?

## Device Handling

1. Every ESDS items identified by EIA-471 labels on item or packaging?
2. All ESDS items completely inside properly closed static-shielding containers when not at static-safe workstation?
3. No static charge generators (e.g. plastics) inside shielding containers with ESDS items?
4. All flexible conductive and dissipative package materials inspected before reuse or recycles?

## Others

1. Audit result reported to entity ESD control coordinator?
2. Corrective action from previous audits completed?
3. Are audit records complete and on file?