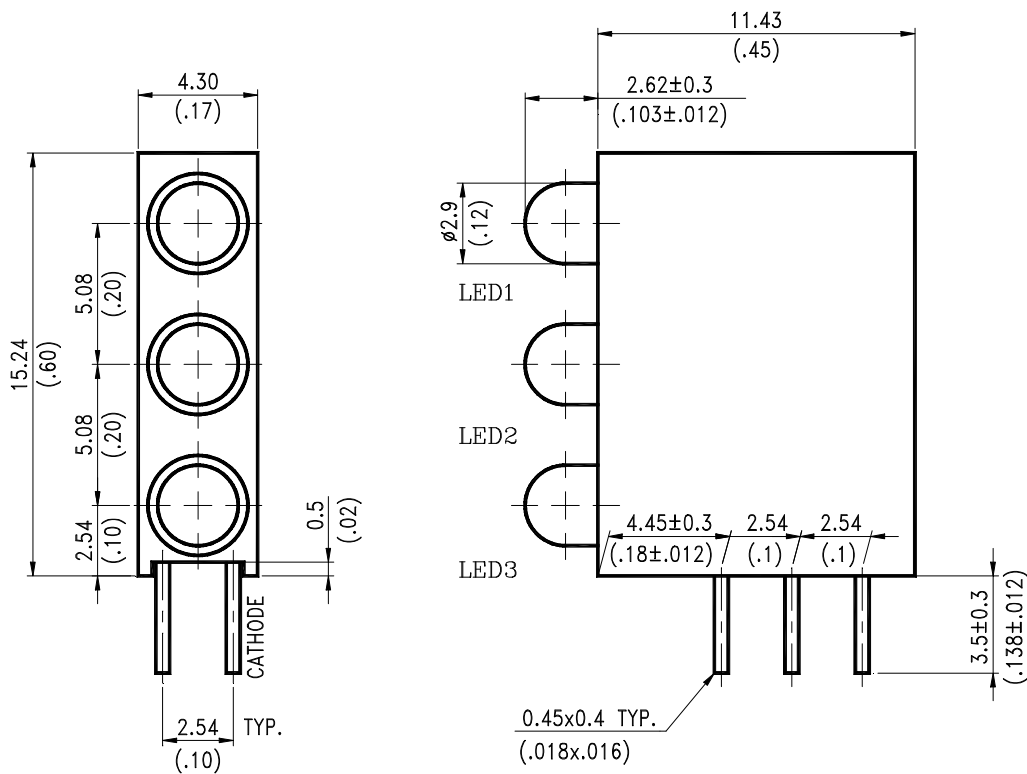


Property of Lite-On Only

### Features

- \* Lead (Pb) free product – RoHS compliant.
- \* Designed for ease in circuit board assembly.
- \* Black case enhance contrast ratio.
- \* Solid state light source.
- \* Reliable and rugged.

### Package Dimensions



Part No.	Lens	Source Color
LTL-4221N	Red Diffused	Hi.Eff.Red
LTL-4251N	Yellow Diffused	Yellow
LTL-4231N	Green Diffused	Green

**Notes:**

1. All dimensions are in millimeters (inches).
2. Tolerance is  $\pm 0.25\text{mm} (.010\text{'})$  unless otherwise noted.
3. The holder color is black p/n: 46L039A and p/n: 46L039B.
4. The LED1 lamp is LTL-4221N, LED2 lamp is LTL-4251N. The LED3 lamp is LTL-4231N.
5. Specifications are subject to change without notice.



**Absolute Maximum Ratings at Ta=25°C**

Parameter	Hi.Eff.Red	Yellow	Green	Unit
Power Dissipation	100	60	100	mW
Peak Forward Current (1/10 Duty Cycle, 0.1ms Pulse Width)	120	80	120	mA
Continuous Forward Current	30	20	30	mA
Derating Linear From 50°C	0.4	0.25	0.4	mA/°C
Reverse Voltage	5	5	5	V
Operating Temperature Range	-55°C to + 100°C			
Storage Temperature Range	-55°C to + 100°C			
Lead Soldering Temperature [2.0mm(.08") From Body]	260°C for 5 Seconds Max.			

## Electrical Optical Characteristics at Ta=25°C

Parameter	Symbol	LTL-4221N LTL-4251N LTL-4231N	Min.	Typ.	Max.	Unit	Test Condition
Luminous Intensity	I <sub>v</sub>	Hi.Eff.Red Yellow Green	2.5 3.7 5.6	8.7 12.5 12.6	40 30 50	mcd	I <sub>F</sub> = 10mA Note 1,4
Viewing Angle	2θ <sub>1/2</sub>	Hi.Eff.Red Yellow Green		60		deg	Note 2 (Fig.6)
Dominant Wavelength	λ <sub>d</sub>	Hi.Eff.Red Yellow Green	615 584 564	625 588 569	632 595 574	nm	Note 3
Spectral Line Half-Width	Δλ	Hi.Eff.Red Yellow Green		40 35 30		nm	
Forward Voltage	V <sub>F</sub>	Hi.Eff.Red Yellow Green		2.0 2.1 2.1	2.6 2.6 2.6	V	I <sub>F</sub> = 20mA
Reverse Current	I <sub>R</sub>	Hi.Eff.Red Yellow Green			100	μA	V <sub>R</sub> = 5V
Capacitance	C	Hi.Eff.Red Yellow Green		20 15 35		PF	V <sub>F</sub> = 0, f = 1MHz

Note: 1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE eye-response curve.

2. θ<sub>1/2</sub> is the off-axis angle at which the luminous intensity is half the axial luminous intensity.

3. The dominant wavelength, λ<sub>d</sub> is derived from the CIE chromaticity diagram and represents the single wavelength which defines the color of the device.

4. I<sub>v</sub> needs ±15% additional for guaranteed limits.

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## Typical Electrical / Optical Characteristics Curves

(25°C Ambient Temperature Unless Otherwise Noted)

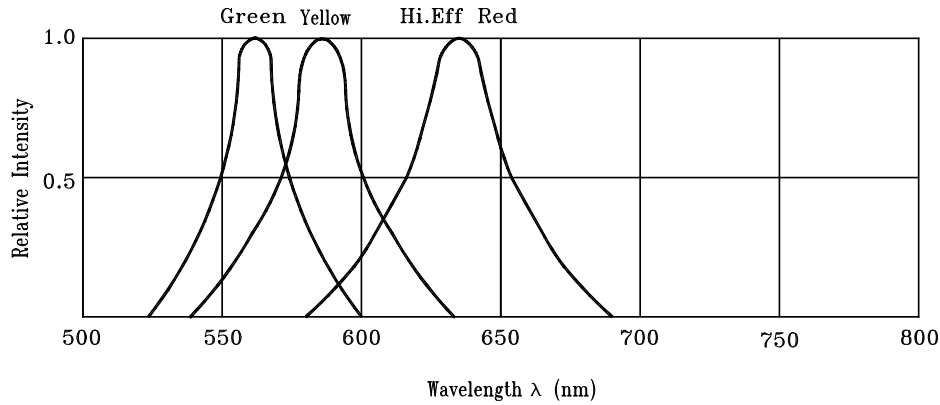


Fig.1 Relative Intensity vs. Wavelength

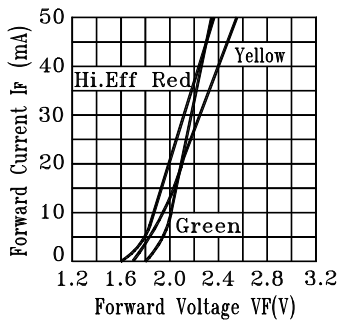


Fig.2 Forward Current vs. Forward Voltage

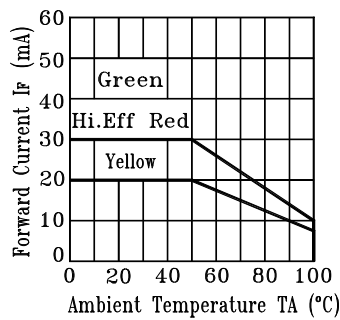


Fig.3 Forward Current Derating Curve

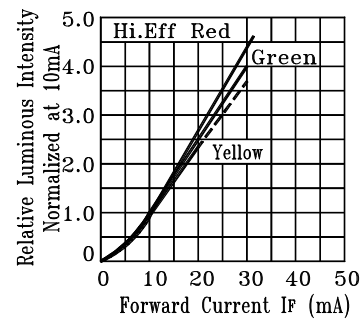


Fig.4 Relative Luminous Intensity vs. Forward Current

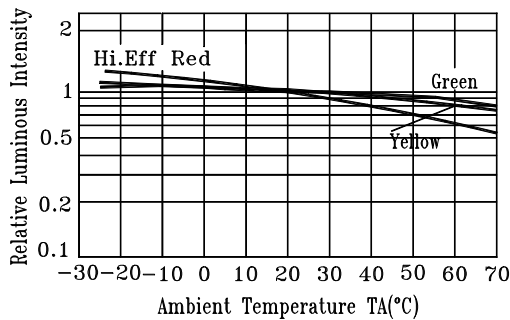


Fig.5 Luminous Intensity vs. Ambient Temperature

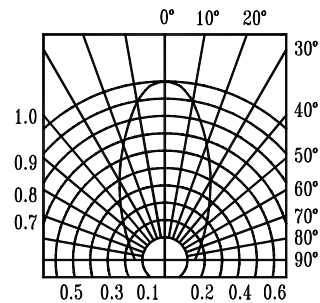
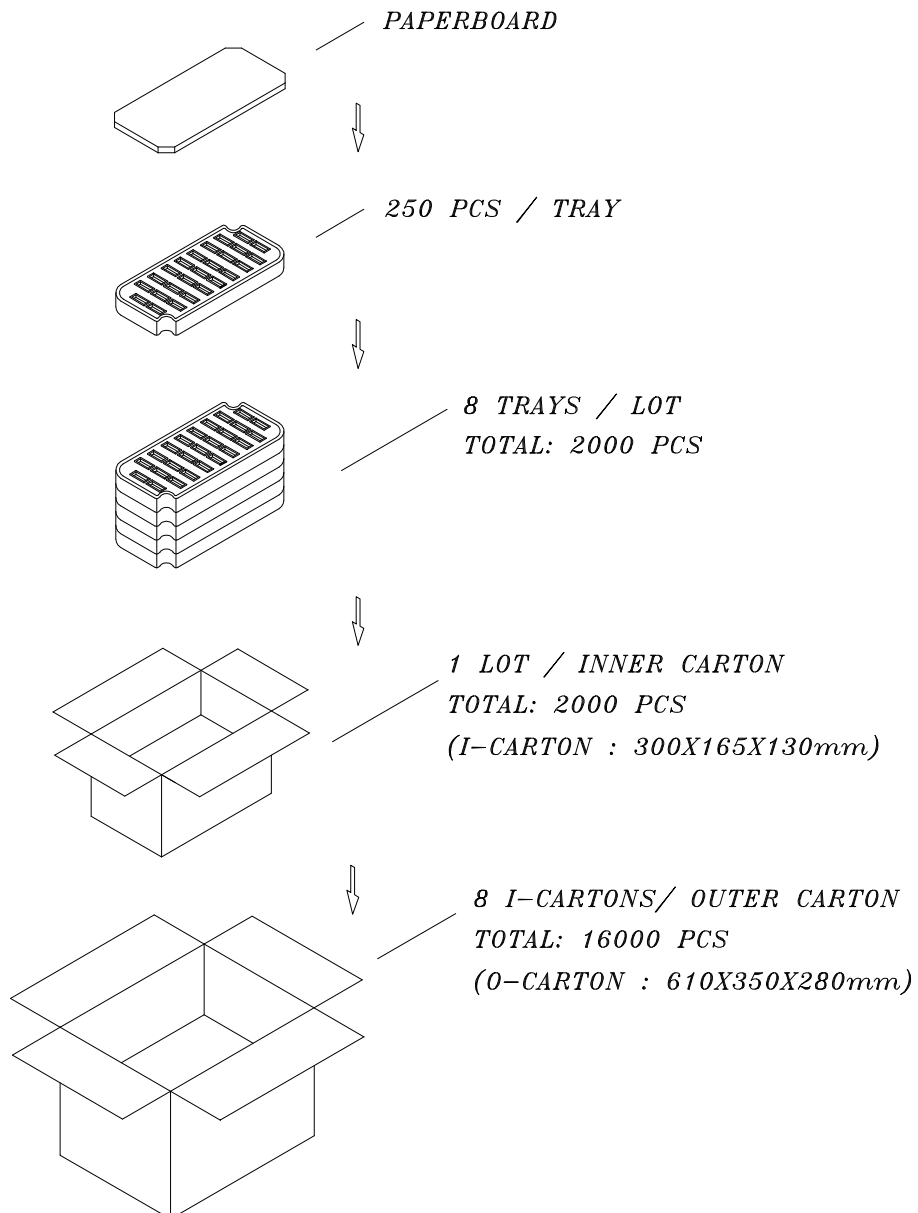


Fig.6 Spatial Distribution

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## Packing Spec.



**Bin Table Specification**

<b>LTL-4221N Hi.Eff.Red</b>	<b>LTL-4251N Yellow</b>	<b>LTL-4231N Green</b>	<b>Holder bin batch</b>
L1 ,K1	1Y,1OY	L2PG,L2YG	A
	1Y,1OY	L2GG,L2GG1	B
	1PY,1YY	L2PG,L2YG	C
	1PY,1YY	L2GG,L2GG1	D
	J1Y,J1PY	L2PG,L2YG	E
K2 ,K3	J1Y,J1PY	L2GG,L2GG1	F
	J1Y,J1PY	L3PG,L3YG	G
	J1Y,J1PY	L3GG,L3GG1	H
	J1YY,J1YY1	L3PG,L3YG	I
	J1YY,J1YY1	L3GG,L3GG1	J
K4 ,K5	J1YY,J1YY1	L3PG,L3YG	K
	J1YY,J1YY1	L3GG,L3GG1	L
	J1Y,J1PY	L3PG,L3YG	M
	J2Y,J2PY	L3GG,L3GG1	N
	J2YY,J2YY1	L3PG,L3YG	O
	J2YY,J2YY1	L3GG,L3GG1	P

Note: Tolerance of each bin limit is  $\pm 15\%$

Tolerance of each bin limit is  $\pm 1\text{nm}$

**CAUTIONS****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).

**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 used within three months. 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 desiccators with nitrogen ambient.

**3. Cleaning**

Use alcohol-based cleaning solvents such as isopropyl alcohol to clean the LEDs if necessary.

**4. Lead Forming & Assembly**

During lead forming, the leads should be bent at a point at least 3mm from the base of LED lens. Do not use the base of the lead frame as a fulcrum during forming. Lead forming must be done before soldering, at normal temperature. During assembly on PCB, use minimum clinch force possible to avoid excessive mechanical stress.

**5. Soldering**

When soldering, For Lamp without stopper type and must be leave a minimum of 2 mm clearance from the base of the lens to the soldering point.

To avoided the Epoxy climb up on lead frame and was impact to non-soldering problem, Dipping the lens into the solder must be avoided.

Do not apply any external stress to the lead frame during soldering while the LED is at high temperature.

Recommended soldering conditions :

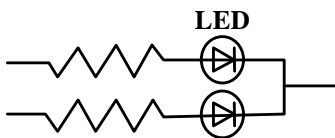
Soldering iron		Wave soldering	
Temperature	350°C Max.	Pre-heat	100°C Max.
Soldering time	3 sec. Max. (one time only)	Pre-heat time	60 sec. Max.
		Solder wave	260°C Max.
		Soldering time	5 sec. Max.

Note: Excessive soldering temperature and/or time might result in deformation of the LED lens or catastrophic failure of the LED. IR reflow is not suitable process for through hole type LED lamp product.

## 6. Drive Method

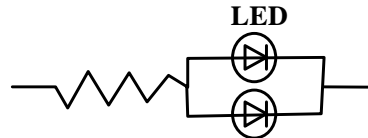
An LED is a current-operated device. In order to ensure intensity uniformity on multiple LEDs connected in parallel in an application, it is recommended that a current limiting resistor be incorporated in the drive circuit, in series with each LED as shown in Circuit A below.

**Circuit model A**



(A) Recommended circuit

**Circuit model B**



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

## 7. 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 LEDs plastic lens as a result of friction between LEDs during storage and handling



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 DSL?
5. All wrist strap or heel strap checkers calibration up to date?

Note: \*50V for Blue LED.

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 recycle?

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?

**8. Reliability Test**

Classification	Test Item	Test Condition	Reference Standard
Endurance Test	Operation Life	Ta= Under Room Temperature As Per Data Sheet Maximum Rating *Test Time= 1000HRS (-24HRS,+72HRS)	MIL-STD-750D:1026 (1995) MIL-STD-883D:1005 (1991) JIS C 7021:B-1 (1982)
	High Temperature High Humidity Storage	Ta= 65±5°C RH= 90 ~ 95% Test Time= 240HRS±2HRS	MIL-STD-202F: 103B(1980) JIS C 7021 : B-11(1982)
	High Temperature Storage	Ta= 105±5°C *Test Time= 1000HRS (-24HRS,+72HRS)	MIL-STD-883D:1008 (1991) JIS C 7021:B-10 (1982)
	Low Temperature Storage	Ta= -55±5°C *Test Time=1000HRS (-24HRS,+72HRS)	JIS C 7021:B-12 (1982)
Environmental Test	Temperature Cycling	105°C ~ 25°C ~ -55°C ~ 25°C 30mins 5mins 30mins 5mins 10 Cycles	MIL-STD-202F:107D (1980) MIL-STD-750D:1051(1995) MIL-STD-883D:1010 (1991) JIS C 7021: A-4(1982)
	Thermal Shock	105 ± 5°C ~ -55°C ± 5°C 10mins 10mins 10 Cycles	MIL-STD-202F:107D(1980) MIL-STD-750D:1051(1995) MIL-STD-883D:1011 (1991)
	Solder Resistance	T.sol = 260 °C Max. Dwell Time= 5 secs Max.	MIL-STD-202F:210A(1980) MIL-STD-750D:2031(1995) JIS C 7021: A-1(1982)
	Solderability	T. sol = 230 ± 5°C Dwell Time= 5 ± 1secs	MIL-STD-202F:208D(1980) MIL-STD-750D:2026(1995) MIL-STD-883D:2003(1991) JIS C 7021: A-2(1982)

**9. Others**

The appearance and specifications of the product may be modified for improvement, without prior notice.