EOI
EXCELLENCE OPTO. INC.

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| A-L-334-00 | 2005/9/20 | 1/11 | B-00 |

# LED SPECIFICATION

## PART NO. : EOL-M9YECC0-TK

PART DESCRIPTION:

5 Ø 8° Yellow LED Lamp

| EOI | | | CUSTOMER APPROVED |
|---|---|---|---|
| ACTION | NAME | DATE | |
| PREPARED | Cathy Huang | 2005/9/20 | |
| CHECKED | Amy Lin | 2005/9/20 | |
| APPROVED | Ader Wu | 2005/9/20 | |

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# PART NO. : EOL-M6YBCC0-TK

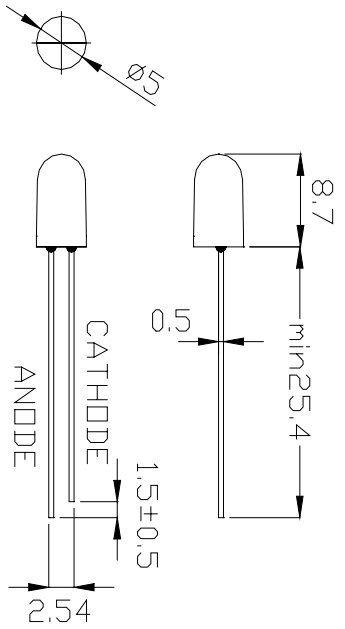
## Features

- Standard T-1 3/4 Package
- High brightness AlGaInP LED
- UV Resistant Epoxy
- Pb free & RoHS Compliant Product

## Applications

- Indoor/Outdoor Applications
- Indicator
- Vehicle Tail Light
- Variable Message Signs
- Center High Mount Stop Light
- Traffic Signal Light

## Package Dimension

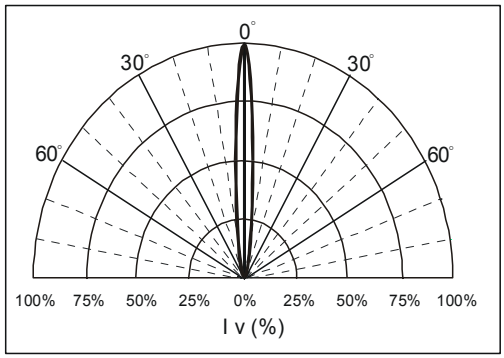



**Notes:**

1. All dimensions are in millimeter.
2. Tolerance is ±0.20mm unless otherwise noted.
3. Protruded resin under flange is 1.5mm max.
4. Lead spacing is measured where the leads emerge from the package.

| Lens Color | Beam Color | Lead Frame Material | Stand Off | Flange |
|---|---|---|---|---|
| Clear Water | Red | Iron base | No | No |

## Beam Pattern



# PART NO. : EOL-M6YBCC0-TK

## Absolute Maximum Ratings at $T_A$=25℃

| Parameter | MAX. | Unit |
|---|---|---|
| Power Dissipation | 78 | mW |
| Peak Forward Current[a] ($I_{FP}$) | 100 | mA |
| DC Forward Current[b] ($I_F$) | 30 | mA |
| Current Linearity vs. Ambient Temperature | - 0.5 | mA/℃ |
| Reverse Voltage ($V_R$) | 5 | V |
| LED Junction Temperature | 125 | ℃ |
| Operating Temperature Range[c] | -40℃ to +85℃ | |
| Storage Temperature Range | -40℃ to +100℃ | |
| Lead Soldering Condition [4mm(.157") away from epoxy] | 260±5℃ for 5 Seconds | |

**Note:** [a] Duty Ratio=1/10,Pulse Width=0.1ms.
[b] Design of heat dissipation should be considered.
[c] The allowable operating current see page 4 Fig 4.

## Electrical and Optical Characteristics at $T_A$ =25℃

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Test Condition |
|---|---|---|---|---|---|---|
| Luminous Intensity | Iv | 9690 | 13000 | --- | mcd | $I_F$=20mA |
| Viewing Angle | $2\theta_{1/2}$ | --- | 8 | --- | Deg | $I_F$=20mA |
| Dominant Wavelength | $\lambda$ d | --- | 589 | --- | nm | $I_F$=20mA |
| Spectra Half width | $\triangle\lambda$ | --- | 25 | --- | nm | $I_F$=20mA |
| Forward Voltage | $V_F$ | --- | 2.2 | 2.6 | V | $I_F$=20mA |
| Reverse Current | $I_R$ | --- | --- | 10 | μA | $V_R$=5V |

## Ranks Combination

| Dominant Wavelength $\lambda_D$ (nm) @$I_F$=20mA | | | Luminous Intensity Iv (mcd) @$I_F$=20mA | | | Forward Voltage $V_F$ (v) @$I_F$=20mA | | |
|---|---|---|---|---|---|---|---|---|
| Code | min | max | Code | min | max | Code | min | max |
| Y3 | 585 | 589 | 6Y | 9690 | 13570 | G | 1.8 | 2.0 |
| Y4 | 589 | 592 | 6Z | 13570 | 19000 | H | 2.0 | 2.2 |
| Y5 | 592 | 595 | - | - | - | J | 2.2 | 2.4 |
| - | - | - | - | - | - | 6 | 2.4 | 2.6 |

**Note:**

1. All ranks of total luminous Intensity will be included in every shipment.
2. Measurement Uncertainty of the Luminous Intensity: ±15%
3. Measurement Uncertainty of the Dominant Wavelength: ±1nm
4. Measurement Uncertainty of the Voltage: ±0.05V

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## Typical Electrical / Optical Characteristics Curves

**(25℃ Ambient Temperature Unless Otherwise Noted)**

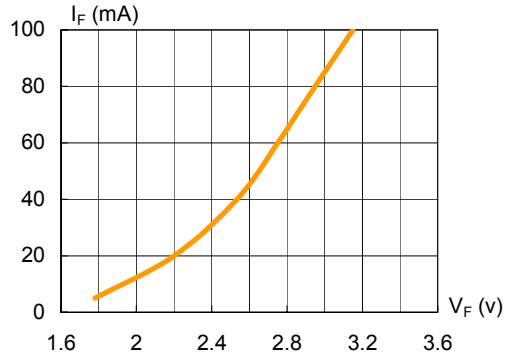


Fig.1 Forward Current vs. Forward Voltage

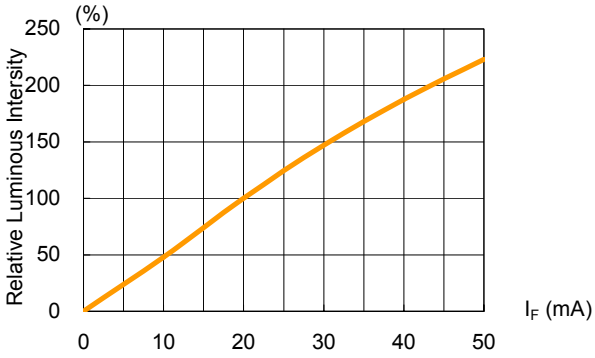


Fig.2 Luminous Intensity vs. Forward Current

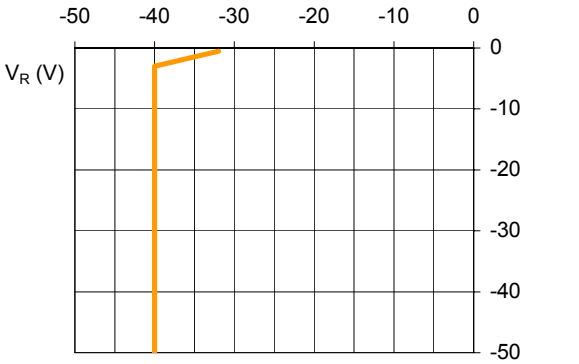


Fig.3 Reverse Current vs. Reverse Voltage $I_R$ ($\mu$A)

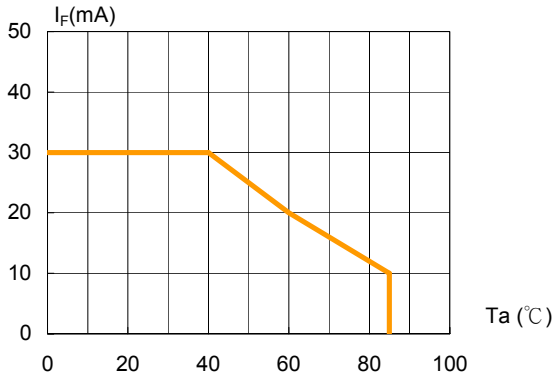


Fig.4 Allowable Forward Current vs. Ambient Temperature

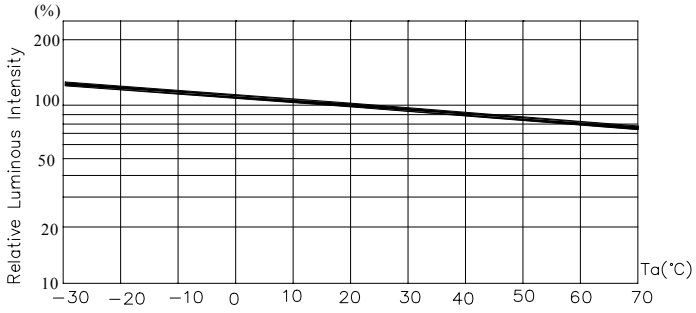


Fig.5 Luminous Intensity at IF=20mA vs. Ambient Temperature

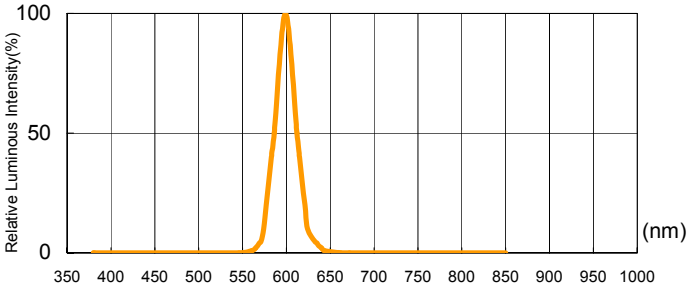


Fig 6. Relative Luminous Intensity vs. Wavelength

***Note: The data shown above are typical curves. Every LED component may have some variations of characteristics.**

## Reliability Criteria & Results

EOI'S LED lamps are checked by reliability test based on MIL standards.

### 1. Test Conditions, Accept Criteria & Results:

| Classi-fication | Test Item | Standard Test Method | Test Conditions | Duration | Units Tested | Acc/Rej Criteria |
|---|---|---|---|---|---|---|
| Life Test | Operating Life Test (OLT) | MIL-STD-750D Method 1026.3 | Ta=25℃ ; $I_F$=30mA(*) | 1000hrs | 100 pcs | 0/1 |
| Environment Test | High Temperature Storage (HTS) | MIL-STD-750D Method 1032.1 | Ta=100℃ | 1000hrs | 100 pcs | 0/1 |
| | Low Temperature Storage (LTS) | MIL-STD-750D Method 1032.1 | Ta= -40℃ | 1000hrs | 100 pcs | 0/1 |
| | Temp. & Humidity with Bias (THB) | MIL-STD-750D Method 103B | Ta=85℃ ; Rh=85% ; $I_F$=20mA (**) | 500hrs | 100 pcs | 0/1 |
| | Thermal Shock Test (TST) | MIL-STD-750D Method 1056.1 | 0 ℃ ~ 100℃<br>2min 2 min | 100 cycles | 100 pcs | 0/1 |
| | Temperature Cycling Test (TCT) | MIL-STD-750D Method 1051.5 | -40℃~ 25℃~ 100℃~ 25℃<br>30min 5min 30min 5min | 100 cycles | 100 | 0/1 |
| Mechanical Test | Solderability | MIL-STD-750D Method 2026.4 | 235±5℃ ; 5sec | 1 time | 20 pcs | 0/1 |
| | Resistance to Soldering Heat | MIL-STD-750D Method 2031.1 | 260±5℃ ; 10sec | 1 time | 20 pcs | 0/1 |
| | Lead Integrity | MIL-STD-750D Method 2036.3 | Load 2.5N (0.25kgf)<br>0°~90°~0° bend | 3 times | 20 pcs | 0/1 |

Remark:

(* ) $I_F$ = 30 mA for AlInGaP chip ; $I_F$ = 20 mA for InGaN chip

(**) $I_F$ = 20 mA for AlInGaP chip ; $I_F$ = 10 mA for InGaN chip

### 2. Failure Criteria (Ta =25℃):

| Test Item | Symbol | Test Conditions | Criteria for Judgement | |
|---|---|---|---|---|
| | | | Min. | Max. |
| Luminous Intensity | $I_V$ | $I_F$ = 20mA | LSL×0.7** | |
| Voltage (Forward) | $V_F$ | $I_F$ = 20mA | | USL × 1.1* |

*USL : Upper Standard Level

**LSL : Low Standard Level

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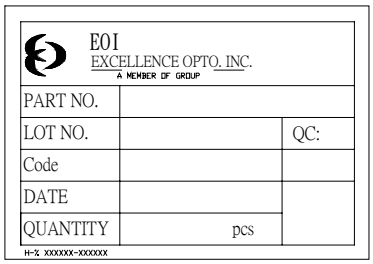
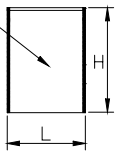
## Bulk Package



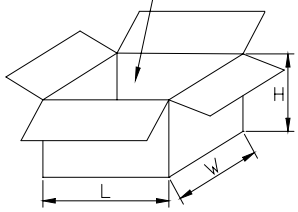

label

| Anti-static/anti-corrosion bag |
|---|
| H : 200mm |
| L : 180mm |
| PCS/BAG |
| 3.0/4.0/5.0mm: 500pcs |
| >7.5mm : 400pcs |



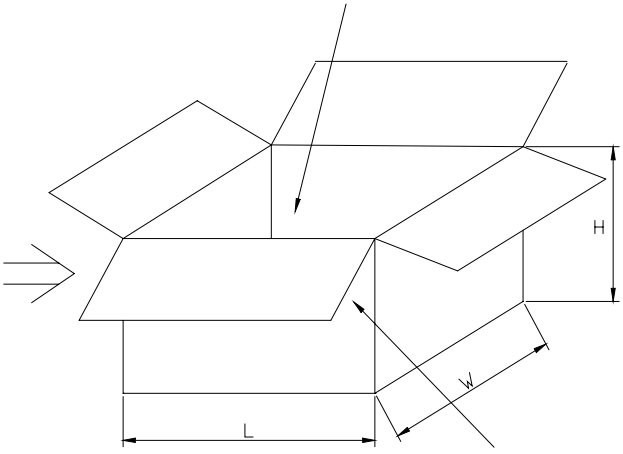

Bag

| Corrugated paper box(3 layers) |
|---|
| H : 140mm |
| L : 350mm |
| W : 260mm |
| PCS/INNER BOX |
| 3.0/4.0/5.0mm: 5,000pcs |
| >7.5mm : 4,000pcs |




Inner Box

| Corrugated paper box(5 layers) |
|---|
| H : 320mm |
| L : 380mm |
| W : 280mm |
| PCS/OUTER BOX |
| 3.0/4.0/5.0mm:10,000pcs |
| >7.5mm : 8,000pcs |




Outer Box

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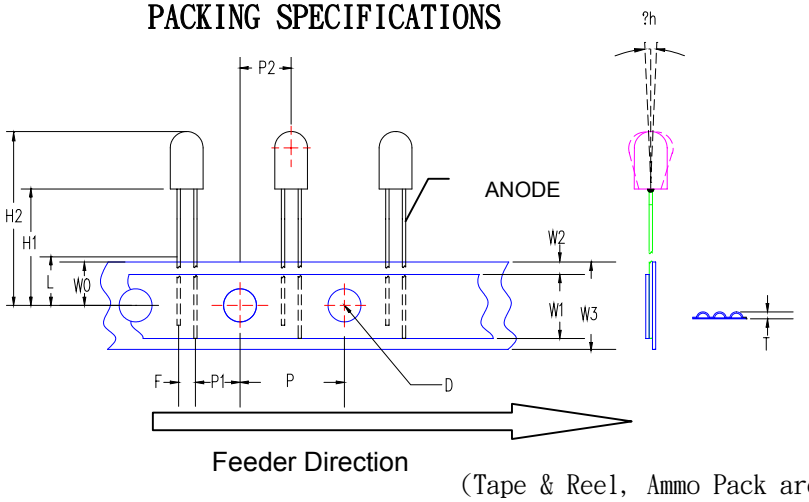
## Taping Package

(TT-0001)

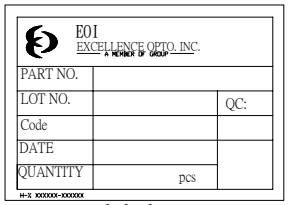
PACKING SPECIFICATIONS



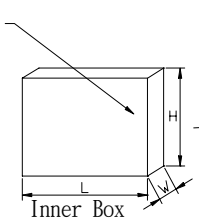

(Tape & Reel, Ammo Pack are available)

(Maximum 10 inner boxes in one outer box)

| ITEM | SYMBOL | SPECIFICATION | | | |
|---|---|---|---|---|---|
| | | MINIMUM | | MAXIMUM | |
| | | MM | INCH | MM | INCH |
| • Tape Feed Hole Diameter | D | 3.8 | 0.149 | 4.2 | 0.165 |
| • Component Lead Pitch | F | 2.34 | 0.092 | 2.74 | 0.108 |
| • Front To Rear Deflection | △ h | -- | -- | 2.0 | 0.078 |
| • Feed Hole To Bottom Of Component | H1 | 19.0 | 0.709 | 21.0 | 0.787 |
| • Feed Hole To Overall Component Height | H2 | -- | -- | 32.00 | 1.260 |
| • Lead Length After Component Height | L | W0 | | 11.0 | 0.433 |
| • Feed Hole Pitch | P | 12.4 | 0.488 | 13.0 | 0.511 |
| • Lead Location | P1 | 4.4 | 0.173 | 5.8 | 0.228 |
| • Center Of Component Location | P2 | 5.05 | 0.198 | 7.65 | 0.301 |
| • Total Tape Thickness | T | -- | -- | 1.4 | 0.056 |
| • Feed Hole Location | W0 | 8.5 | 0.334 | 9.50 | 0.374 |
| • Adhesive Tape Width | W1 | 12.0 | 0.472 | 14.0 | 0.551 |
| • Adhewive Tape Position | W2 | -- | -- | 4.0 | 0.157 |
| • Tape Width | W3 | 17.5 | 0.689 | 19.0 | 0.748 |

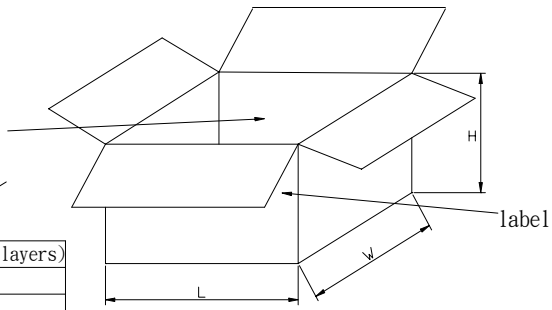



label




Inner Box

| Corrugated paper box(3 layers) |
|---|
| H : 250mm |
| L : 330mm |
| W : 50mm |
| PCS/INNER BOX |
| 3/4mm :2,500pcs |
| 5.0mm :2,000pcs |
| > 7.5mm :1,000pcs |




Outer Box

| Corrugated paper box(5 layers) |
|---|
| H : 290mm |
| L : 520mm |
| W : 360mm |
| PCS/OUTER BOX |
| 3/4mm :25,000pcs |
| 5.0mm :20,000pcs |
| > 7.5mm :10,000pcs |

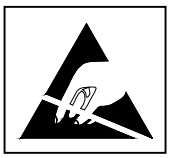
## Precaution of Application

### 1. Circuit layout

Due to the circuit design is not available, assuming the LED are used in parallel and one resistor that is put in series in the circuit, it may not provide and effective current-limiting function to the LEDs due to each LED has own inherent resistance, maybe the resistance each other is different. Different inherent resistance will cause different current; the LED on the different path would be driven at different power. If one LED with a higher resistance, it would be dimmer than the others.

To solve this situation, a suitable resistor is put in series with each LED to limit her current disparity through the LED will be very useful.

### 2. Electric Static Discharge (ESD) Protection



ESD protection for GaP and AlGaAs chips are still necessary even though they are safety in low static-electric discharge. Material in AlInGaP, GaN, or/and InGaN chips are STATIC SENSITIVE device. ESD protection shall be considered and taken in the initial design stage.

If manual work/process is needed, please ensure the device is well protective from ESD within all the process.

### 3. Lead Froming

The leads should not be bent at the point of 3mm or above from the base of the epoxy bulb while forming the leads.

Do not apply any bending stress to the base of the lead, and don't cause any stress after mounting the LED lamp on PCB. The stress to the base may damage the LED's characteristics, or cause deterioration of the epoxy resin. This will hurt and degrade the LEDs.

## 4. Storage

It's recommended to store the products in the following conditions:

Humidity: 60%RH Max.

Temperature:5℃ ~30℃ ( 41℉ ~86℉ )

Shelf life in sealed bag: 12month at<40℃ and <30%RH.(Base on aluminum laminated moisture barrier bag.) If the LEDs are stored for 3 months or more, the nitrogen atmosphere storage environment is recommended.

Although the leads of LED lamp is platted with pure tin to protect leads from corrosion, devices should be subjected to wave soldering, or equivalent process as soon as possible, after the bag is opened.

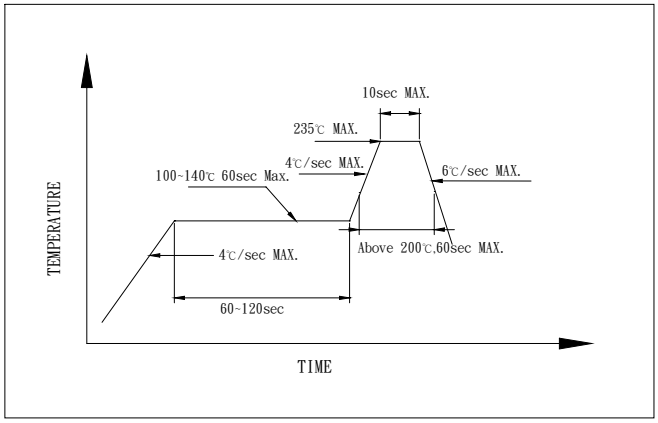
Please avoid rapid transitions in ambient temperature, especially in high humidity environment where condensation can occur.

## 5. Soldering

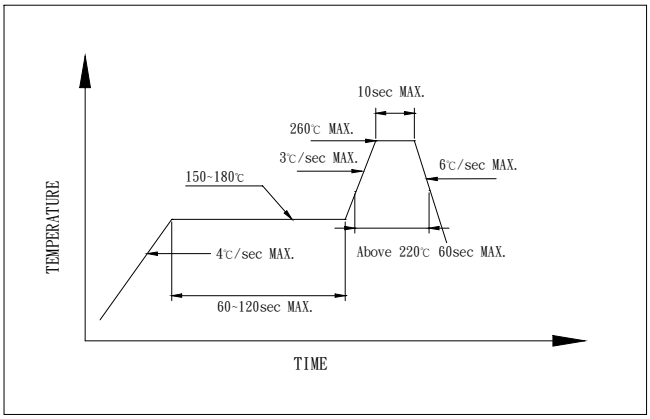
Soldering heat may damage the LED. Careful attention should be paid during soldering process.

Solder the LEDs no close than 3mm form the base of the epoxy bulb.

Recommended SnPb reflow soldering profile:




Recommended Pb free reflow soldering profile:




Never take next process until the component is cooled down to room temperature after soldering. It's banned to load any stress on the resin during soldering. If it's necessary to clamp the LED bulbs to help soldering, it is important to minimize the mechanical stress on the LEDs.

The manual soldering process is not recommended for quality consideration. When it is absolutely necessary, the LEDs may be mounted in this fashion but the user will assume responsibility for any problems.

## 6. Cleaning

An alcohol-based solvent such as isopropyl alcohol (IPA) is recommended to clean the LED bulbs, after soldering process. Before cleaning, a pre-test should be done to confirm whether any damage to the LEDs will occur.

## 7. Others

The light output of LED might injure human eyes, directly look at the LED without protection is prohibited.

LED lamp is very sensitive to heat. Thermal design of the end product will decide the performance of LED lamps. It's necessary to avoid intense heat generation and operate within the maximum ratings given in this specification.

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## Terms and Condition

1. EOI warrants all sold LEDs which conform to the specifications approved by the customers.
2. Any LED supplied by EOI is found not conform to the specifications that both parties agreed upon, customer should claim within 90days of receipt. EOI will repair or replace the LEDs at EOI's option.
3. EOI will not hold any responsibility for the failed LEDs, which are caused by mishandling or using the LEDs exceeding the operating conditions that EOI suggested.
4. EOI's LED products are designed and manufactured for general electronic equipment (such as household appliances, communication equipment, office equipment, electronic instrumentation and so on). If customer's application requires exceptional quality or reliability, which might concern human safety, it is recommended to consult with EOI in advance.
5. All the information published is considered to be reliable. However, EOI does not assume any liability arising out of the application or use of any product described herein. EOI's liability for defective LED lamps shall only be limited to replacement, in no event shall EOI be liable for consequential damages or profit lose.
6. EOI and customer shall both confirm the specifications herein, and all quality related matters will base on the specifications both parties agreed upon.
7. Any modification of the design or manufacturing process taken place, which will affect the characteristics, performance or reliability of LED, customer's approval will be required.
8. This specification approval sheet is an agreement of shipment specification. Please sign it back and keep the copies in two parties. If customers don't sign it back, it is regarded as completely agree with the terms and conditions and also approve of this approval sheet.

## Company Information


**Head Quarter**

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