



## T-1<sup>3</sup>/<sub>4</sub> (5mm) Ultra Bright AS AlInGaP LED Lamps

|                                   |          |
|-----------------------------------|----------|
| LTL2F3QRK/QEK/QHK/QAK/QFK/QYK/YSK | 8degree  |
| LTL2H3QRK/QEK/QHK/QAK/QFK/QYK/YSK | 15degree |
| LTL2P3QRK/QEK/QHK/QAK/QFK/QYK/YSK | 22degree |
| LTL2R3QRK/QEK/QHK/QAK/QFK/QYK/YSK | 30degree |

### Features

- High luminous intensity output.
- Low power consumption.
- High efficiency.
- Versatile mounting on P.C. board or panel.
- I.C. Compatible/low current requirements.
- Popular T-13/4 diameter.

### Description

The source color devices are made with Aluminum Indium Gallium Phosphide on Gallium Arsenide light emitting diode.

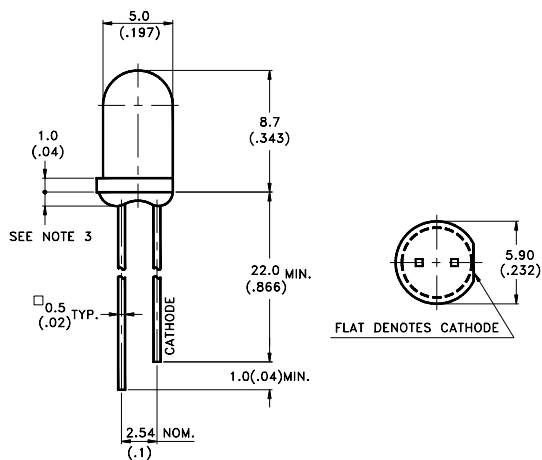
The devices are made with water clear epoxy package. And with 8,15,22 and 30 degrees of viewing angle.

### Application

Available for outdoor application.

- Message sign.
- Traffic sign.
- Automotive.

### Package Dimensions



#### Notes:

1. All dimensions are in millimeters (inches).
2. Tolerance is  $\pm 0.25\text{mm}$  (.010") unless otherwise noted.
3. Protruded resin under flange is 1.0mm (.04") max.
4. Lead spacing is measured where the leads emerge from the package.
5. Specifications are subject to change without notice.

### Devices

| Part No.<br>LTL                    | Lens        | Source Color          |
|------------------------------------|-------------|-----------------------|
| 2F3QRK / 2H3QRK<br>2P3QRK / 2R3QRK | Water Clear | AlInGaP Super Red     |
| 2F3QEK / 2H3QEK<br>2P3QEK / 2R3QEK | Water Clear | AlInGaP Red           |
| 2F3QHK / 2H3QHK<br>2P3QHK / 2R3QHK | Water Clear | AlInGaP Red Orange    |
| 2F3QAK / 2H3QAK<br>2P3QAK / 2R3QAK | Water Clear | AlInGaP Red Orange    |
| 2F3QFK / 2H3QFK<br>2P3QFK / 2R3QFK | Water Clear | AlInGaP Yellow Orange |
| 2F3QYK / 2H3QYK<br>2P3QYK / 2R3QYK | Water Clear | AlInGaP Amber Yellow  |
| 2F3QSK / 2H3QSK<br>2P3QSK / 2R3QSK | Water Clear | AlInGaP Yellow        |

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

| Parameter                                                    | Super Red           | Red | Red Orange | Red Orange | Yellow Orange | Amber Yellow | Yellow | Unit  |
|--------------------------------------------------------------|---------------------|-----|------------|------------|---------------|--------------|--------|-------|
| Power Dissipation                                            | 120                 | 120 | 120        | 120        | 120           | 120          | 120    | mW    |
| Peak Forward Current<br>(1/10 Duty Cycle, 0.1ms Pulse Width) | 160                 | 160 | 160        | 160        | 160           | 160          | 160    | mA    |
| Continuous Forward Current                                   | 50                  | 50  | 50         | 50         | 50            | 50           | 50     | mA    |
| Derating Linear From 50°C                                    | 0.6                 | 0.6 | 0.6        | 0.6        | 0.6           | 0.6          | 0.6    | mA/°C |
| Reverse Voltage                                              | 5                   | 5   | 5          | 5          | 5             | 5            | 5      | v     |
| Operating Temperature Range                                  | -40°C to + 100°C    |     |            |            |               |              |        |       |
| Storage Temperature Range                                    | -55°C to + 100°C    |     |            |            |               |              |        |       |
| Lead Soldering Temperature<br>[1.6mm(.063") From Body]       | 260°C for 5 Seconds |     |            |            |               |              |        |       |

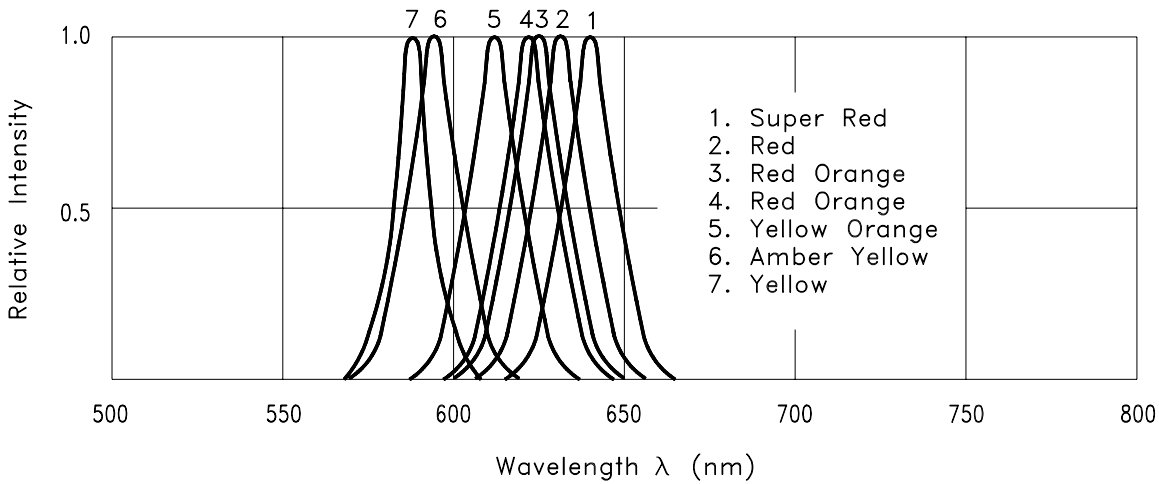


Fig.1 Relative Intensity vs. Wavelength

## Electrical / Optical Characteristics and Curves at Ta= 25℃

| Parameter                   | Symbol            | Part No.<br>LTL | Min. | Typ. | Max. | Unit | Test<br>Condition                        |
|-----------------------------|-------------------|-----------------|------|------|------|------|------------------------------------------|
| Luminous<br>Intensity       | I <sub>v</sub>    | 2F3QRK          | 1000 | 2600 |      | mcd  | I <sub>F</sub> =20mA<br>Note 1<br>Note 2 |
|                             |                   | 2F3QEK          | 1000 | 3600 |      |      |                                          |
|                             |                   | 2F3QHK          | 1000 | 3600 |      |      |                                          |
|                             |                   | 2F3QAK          | 1000 | 3600 |      |      |                                          |
|                             |                   | 2F3QFK          | 1000 | 3600 |      |      |                                          |
|                             |                   | 2F3QYK          | 1000 | 3600 |      |      |                                          |
|                             |                   | 2F3QSK          | 1000 | 3600 |      |      |                                          |
| Peak Emission<br>Wavelength | λ <sub>P</sub>    | 2F3QRK          |      | 639  |      | nm   | Measurement<br>@ peak (Fig.1)            |
|                             |                   | 2F3QEK          |      | 632  |      |      |                                          |
|                             |                   | 2F3QHK          |      | 624  |      |      |                                          |
|                             |                   | 2F3QAK          |      | 621  |      |      |                                          |
|                             |                   | 2F3QFK          |      | 611  |      |      |                                          |
|                             |                   | 2F3QYK          |      | 595  |      |      |                                          |
|                             |                   | 2F3QSK          |      | 588  |      |      |                                          |
| Dominant<br>Wavelength      | λ <sub>d</sub>    | 2F3QRK          |      | 631  |      | nm   | Note 5                                   |
|                             |                   | 2F3QEK          |      | 624  |      |      |                                          |
|                             |                   | 2F3QHK          |      | 618  |      |      |                                          |
|                             |                   | 2F3QAK          |      | 615  |      |      |                                          |
|                             |                   | 2F3QFK          |      | 605  |      |      |                                          |
|                             |                   | 2F3QYK          |      | 592  |      |      |                                          |
|                             |                   | 2F3QSK          |      | 587  |      |      |                                          |
| Spectral Line<br>Half-Width | Δλ                | 2F3QRK          |      | 20   |      | nm   |                                          |
|                             |                   | 2F3QEK          |      | 20   |      |      |                                          |
|                             |                   | 2F3QHK          |      | 18   |      |      |                                          |
|                             |                   | 2F3QAK          |      | 18   |      |      |                                          |
|                             |                   | 2F3QFK          |      | 17   |      |      |                                          |
|                             |                   | 2F3QYK          |      | 15   |      |      |                                          |
|                             |                   | 2F3QSK          |      | 15   |      |      |                                          |
| Forward Voltage             | V <sub>F</sub>    | 2F3QRK          |      | 1.9  | 2.3  | V    | I <sub>F</sub> =20mA                     |
|                             |                   | 2F3QEK          |      | 2.0  | 2.4  |      |                                          |
|                             |                   | 2F3QHK          |      | 2.0  | 2.4  |      |                                          |
|                             |                   | 2F3QAK          |      | 2.0  | 2.4  |      |                                          |
|                             |                   | 2F3QFK          |      | 2.0  | 2.4  |      |                                          |
|                             |                   | 2F3QYK          |      | 2.0  | 2.4  |      |                                          |
|                             |                   | 2F3QSK          |      | 2.0  | 2.4  |      |                                          |
| Viewing Angle               | 2θ <sub>1/2</sub> |                 |      | 8    |      | deg  | Note 2 (Fig.5)                           |
| Reverse Current             | I <sub>R</sub>    |                 |      |      | 100  | μA   | V <sub>R</sub> =5V                       |
| Capacitance                 | C                 |                 |      | 40   |      | pF   | V <sub>F</sub> =0<br>f=1MHz              |

### Notes:

1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE eye-response curve.
2. Luminous intensity rank classified products support two ranks.
3. θ<sub>1/2</sub> is the off-axis angle at which the luminous intensity is half the axial luminous intensity.
4. I<sub>v</sub> classification code is marked on each packing bag.
5. 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.

## Electrical / Optical Characteristics and Curves at Ta= 25°C

| Parameter                   | Symbol            | Part No.<br>LTL | Min. | Typ. | Max. | Unit | Test<br>Condition                        |
|-----------------------------|-------------------|-----------------|------|------|------|------|------------------------------------------|
| Luminous<br>Intensity       | I <sub>v</sub>    | 2H3QRK          | 560  | 1300 |      | mcd  | I <sub>F</sub> =20mA<br>Note 1<br>Note 2 |
|                             |                   | 2H3QEK          | 560  | 1700 |      |      |                                          |
|                             |                   | 2H3QHK          | 560  | 1700 |      |      |                                          |
|                             |                   | 2H3QAK          | 560  | 1700 |      |      |                                          |
|                             |                   | 2H3QFK          | 560  | 1700 |      |      |                                          |
|                             |                   | 2H3QYK          | 560  | 1700 |      |      |                                          |
|                             |                   | 2H3QSK          | 560  | 1700 |      |      |                                          |
| Peak Emission<br>Wavelength | λ <sub>P</sub>    | 2H3QRK          |      | 639  |      | nm   | Measurement<br>@ peak (Fig.1)            |
|                             |                   | 2H3QEK          |      | 632  |      |      |                                          |
|                             |                   | 2H3QHK          |      | 624  |      |      |                                          |
|                             |                   | 2H3QAK          |      | 621  |      |      |                                          |
|                             |                   | 2H3QFK          |      | 611  |      |      |                                          |
|                             |                   | 2H3QYK          |      | 595  |      |      |                                          |
|                             |                   | 2H3QSK          |      | 588  |      |      |                                          |
| Dominant<br>Wavelength      | λ <sub>d</sub>    | 2H3QRK          |      | 631  |      | nm   | Note 5                                   |
|                             |                   | 2H3QEK          |      | 624  |      |      |                                          |
|                             |                   | 2H3QHK          |      | 618  |      |      |                                          |
|                             |                   | 2H3QAK          |      | 615  |      |      |                                          |
|                             |                   | 2H3QFK          |      | 605  |      |      |                                          |
|                             |                   | 2H3QYK          |      | 592  |      |      |                                          |
|                             |                   | 2H3QSK          |      | 587  |      |      |                                          |
| Spectral Line<br>Half-Width | Δλ                | 2H3QRK          |      | 20   |      | nm   |                                          |
|                             |                   | 2H3QEK          |      | 20   |      |      |                                          |
|                             |                   | 2H3QHK          |      | 18   |      |      |                                          |
|                             |                   | 2H3QAK          |      | 18   |      |      |                                          |
|                             |                   | 2H3QFK          |      | 17   |      |      |                                          |
|                             |                   | 2H3QYK          |      | 15   |      |      |                                          |
|                             |                   | 2H3QSK          |      | 15   |      |      |                                          |
| Forward Voltage             | V <sub>F</sub>    | 2H3QRK          |      | 1.9  | 2.3  | V    | I <sub>F</sub> =20mA                     |
|                             |                   | 2H3QEK          |      | 2.0  | 2.4  |      |                                          |
|                             |                   | 2H3QHK          |      | 2.0  | 2.4  |      |                                          |
|                             |                   | 2H3QAK          |      | 2.0  | 2.4  |      |                                          |
|                             |                   | 2H3QFK          |      | 2.0  | 2.4  |      |                                          |
|                             |                   | 2H3QYK          |      | 2.0  | 2.4  |      |                                          |
|                             |                   | 2H3QSK          |      | 2.0  | 2.4  |      |                                          |
| Viewing Angle               | 2θ <sub>1/2</sub> |                 |      | 15   |      | deg  | Note 2 (Fig.5)                           |
| Reverse Current             | I <sub>R</sub>    |                 |      |      | 100  | μA   | V <sub>R</sub> =5V                       |
| Capacitance                 | C                 |                 |      | 40   |      | pF   | V <sub>F</sub> =0<br>f=1MHz              |

### Notes:

1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE eye-response curve.
2. Luminous intensity rank classified products support two ranks.
3. θ<sub>1/2</sub> is the off-axis angle at which the luminous intensity is half the axial luminous intensity.
4. I<sub>v</sub> classification code is marked on each packing bag.
5. 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.

## Electrical / Optical Characteristics and Curves at Ta= 25℃

| Parameter                   | Symbol            | Part No.<br>LTL | Min. | Typ. | Max. | Unit | Test<br>Condition                        |
|-----------------------------|-------------------|-----------------|------|------|------|------|------------------------------------------|
| Luminous<br>Intensity       | I <sub>v</sub>    | 2P3QRK          | 320  | 800  |      | mcd  | I <sub>F</sub> =20mA<br>Note 1<br>Note 2 |
|                             |                   | 2P3QEK          | 320  | 1000 |      |      |                                          |
|                             |                   | 2P3QHK          | 320  | 1000 |      |      |                                          |
|                             |                   | 2P3QAK          | 320  | 1000 |      |      |                                          |
|                             |                   | 2P3QFK          | 320  | 1000 |      |      |                                          |
|                             |                   | 2P3QYK          | 320  | 1000 |      |      |                                          |
|                             |                   | 2P3QSK          | 320  | 1000 |      |      |                                          |
| Peak Emission<br>Wavelength | λ <sub>P</sub>    | 2P3QRK          |      | 639  |      | nm   | Measurement<br>@ peak (Fig.1)            |
|                             |                   | 2P3QEK          |      | 632  |      |      |                                          |
|                             |                   | 2P3QHK          |      | 624  |      |      |                                          |
|                             |                   | 2P3QAK          |      | 621  |      |      |                                          |
|                             |                   | 2P3QFK          |      | 611  |      |      |                                          |
|                             |                   | 2P3QYK          |      | 595  |      |      |                                          |
|                             |                   | 2P3QSK          |      | 588  |      |      |                                          |
| Dominant<br>Wavelength      | λ <sub>d</sub>    | 2P3QRK          |      | 631  |      | nm   | Note 5                                   |
|                             |                   | 2P3QEK          |      | 624  |      |      |                                          |
|                             |                   | 2P3QHK          |      | 618  |      |      |                                          |
|                             |                   | 2P3QAK          |      | 615  |      |      |                                          |
|                             |                   | 2P3QFK          |      | 605  |      |      |                                          |
|                             |                   | 2P3QYK          |      | 592  |      |      |                                          |
|                             |                   | 2P3QSK          |      | 587  |      |      |                                          |
| Spectral Line<br>Half-Width | Δλ                | 2P3QRK          |      | 20   |      | nm   |                                          |
|                             |                   | 2P3QEK          |      | 20   |      |      |                                          |
|                             |                   | 2P3QHK          |      | 18   |      |      |                                          |
|                             |                   | 2P3QAK          |      | 18   |      |      |                                          |
|                             |                   | 2P3QFK          |      | 17   |      |      |                                          |
|                             |                   | 2P3QYK          |      | 15   |      |      |                                          |
|                             |                   | 2P3QSK          |      | 15   |      |      |                                          |
| Forward Voltage             | V <sub>F</sub>    | 2P3QRK          |      | 1.9  | 2.3  | V    | I <sub>F</sub> =20mA                     |
|                             |                   | 2P3QEK          |      | 2.0  | 2.4  |      |                                          |
|                             |                   | 2P3QHK          |      | 2.0  | 2.4  |      |                                          |
|                             |                   | 2P3QAK          |      | 2.0  | 2.4  |      |                                          |
|                             |                   | 2P3QFK          |      | 2.0  | 2.4  |      |                                          |
|                             |                   | 2P3QYK          |      | 2.0  | 2.4  |      |                                          |
|                             |                   | 2P3QSK          |      | 2.0  | 2.4  |      |                                          |
| Viewing Angle               | 2θ <sub>1/2</sub> |                 |      | 22   |      | deg  | Note 2 (Fig.5)                           |
| Reverse Current             | I <sub>R</sub>    |                 |      |      | 100  | μA   | V <sub>R</sub> =5V                       |
| Capacitance                 | C                 |                 |      | 40   |      | pF   | V <sub>F</sub> =0<br>f=1MHz              |

### Notes:

1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE eye-response curve.
2. Luminous intensity rank classified products support two ranks.
3. θ<sub>1/2</sub> is the off-axis angle at which the luminous intensity is half the axial luminous intensity.
4. I<sub>v</sub> classification code is marked on each packing bag.
5. 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.

## Electrical / Optical Characteristics and Curves at Ta= 25°C

| Parameter                   | Symbol            | Part No.<br>LTL | Min. | Typ. | Max. | Unit | Test<br>Condition                        |
|-----------------------------|-------------------|-----------------|------|------|------|------|------------------------------------------|
| Luminous<br>Intensity       | I <sub>v</sub>    | 2R3QRK          | 180  | 500  |      | mcd  | I <sub>F</sub> =20mA<br>Note 1<br>Note 2 |
|                             |                   | 2R3QEK          | 180  | 700  |      |      |                                          |
|                             |                   | 2R3QHK          | 180  | 700  |      |      |                                          |
|                             |                   | 2R3QAK          | 180  | 700  |      |      |                                          |
|                             |                   | 2R3QFK          | 180  | 700  |      |      |                                          |
|                             |                   | 2R3QYK          | 180  | 700  |      |      |                                          |
|                             |                   | 2R3QSK          | 180  | 700  |      |      |                                          |
| Peak Emission<br>Wavelength | λ <sub>P</sub>    | 2R3QRK          |      | 639  |      | nm   | Measurement<br>@ peak (Fig.1)            |
|                             |                   | 2R3QEK          |      | 632  |      |      |                                          |
|                             |                   | 2R3QHK          |      | 624  |      |      |                                          |
|                             |                   | 2R3QAK          |      | 621  |      |      |                                          |
|                             |                   | 2R3QFK          |      | 611  |      |      |                                          |
|                             |                   | 2R3QYK          |      | 595  |      |      |                                          |
|                             |                   | 2R3QSK          |      | 588  |      |      |                                          |
| Dominant<br>Wavelength      | λ <sub>d</sub>    | 2R3QRK          |      | 631  |      | nm   | Note 5                                   |
|                             |                   | 2R3QEK          |      | 624  |      |      |                                          |
|                             |                   | 2R3QHK          |      | 618  |      |      |                                          |
|                             |                   | 2R3QAK          |      | 615  |      |      |                                          |
|                             |                   | 2R3QFK          |      | 605  |      |      |                                          |
|                             |                   | 2R3QYK          |      | 592  |      |      |                                          |
|                             |                   | 2R3QSK          |      | 587  |      |      |                                          |
| Spectral Line<br>Half-Width | Δλ                | 2R3QRK          |      | 20   |      | nm   |                                          |
|                             |                   | 2R3QEK          |      | 20   |      |      |                                          |
|                             |                   | 2R3QHK          |      | 18   |      |      |                                          |
|                             |                   | 2R3QAK          |      | 18   |      |      |                                          |
|                             |                   | 2R3QFK          |      | 17   |      |      |                                          |
|                             |                   | 2R3QYK          |      | 15   |      |      |                                          |
|                             |                   | 2R3QSK          |      | 15   |      |      |                                          |
| Forward Voltage             | V <sub>F</sub>    | 2R3QRK          |      | 1.9  | 2.3  | V    | I <sub>F</sub> =20mA                     |
|                             |                   | 2R3QEK          |      | 2.0  | 2.4  |      |                                          |
|                             |                   | 2R3QHK          |      | 2.0  | 2.4  |      |                                          |
|                             |                   | 2R3QAK          |      | 2.0  | 2.4  |      |                                          |
|                             |                   | 2R3QFK          |      | 2.0  | 2.4  |      |                                          |
|                             |                   | 2R3QYK          |      | 2.0  | 2.4  |      |                                          |
|                             |                   | 2R3QSK          |      | 2.0  | 2.4  |      |                                          |
| Viewing Angle               | 2θ <sub>1/2</sub> |                 |      | 30   |      | deg  | Note 2 (Fig.5)                           |
| Reverse Current             | I <sub>R</sub>    |                 |      |      | 100  | μA   | V <sub>R</sub> =5V                       |
| Capacitance                 | C                 |                 |      | 40   |      | pF   | V <sub>F</sub> =0<br>f=1MHz              |

### Notes:

1. Luminous intensity is measured with a light sensor and filter combination that approximates the CIE eye-response curve.
2. Luminous intensity rank classified products support two ranks.
3. θ<sub>1/2</sub> is the off-axis angle at which the luminous intensity is half the axial luminous intensity.
4. I<sub>v</sub> classification code is marked on each packing bag.
5. 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.

Typical Electrical / Optical Characteristic Curves  
(25°C Ambient Temperature Unless Otherwise Noted)

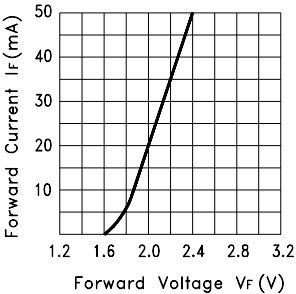


Fig.2 Forward Current vs.  
Forward Voltage

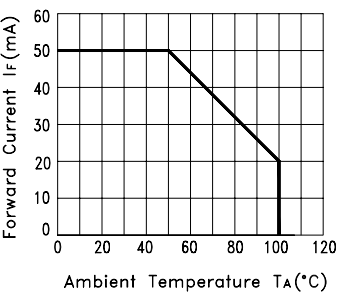


Fig.3 Forward Current  
Derating Curve

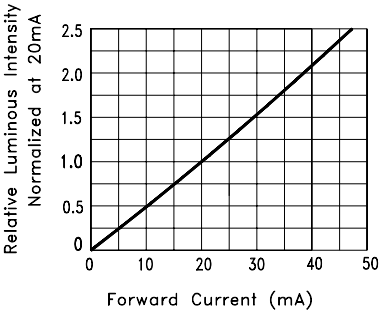


Fig.4 Relative Luminous Intensity  
vs. Forward Current

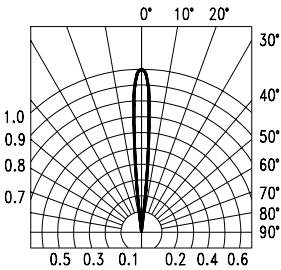


Fig.5-1 Spatial Distribution

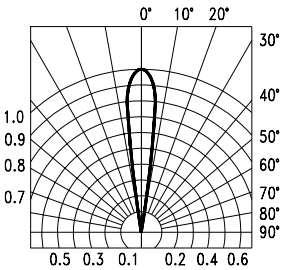


Fig.5-2 Spatial Distribution

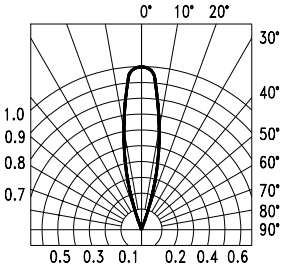


Fig.5-3 Spatial Distribution

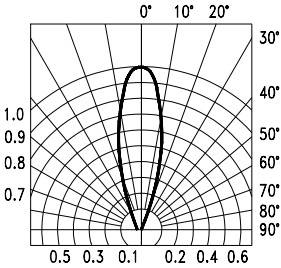


Fig.5-4 Spatial Distribution