

#### Features

- 2.3 inch (58.42mm) matrix height.
- Low power requirement.
- Single plane, wide viewing angle.
- 8  $\times$  8 array with X-Y select
- Compatible with usascil and ebcidc codes.
- Stackable vertically and horizontally.
- Choices of two matrix orientation cathode row or cathode column.
- Easy mounting on P.C. board.
- Categorized for luminous intensity.
- Single color displays have the choices of four bright colors-green/yellow/red orange/AlGaAs red.
- Multicolor displays are applicable to three bright colors : green, red orange and yellow (green and red orange mixed)

#### Description

The LTP-2X88A series are 2.3 inch (58.42mm)matrix height 8  $\times$  8 dot matrix displays.

The LTP-2188AA are multicolor applicable displays.

The multicolor displays have gray face and white dots.

The LTP-2088A series are single color displays. The green, yellow, red orange displays have gray face and white dot color.

The AlGaAs red displays have black face and white dots.

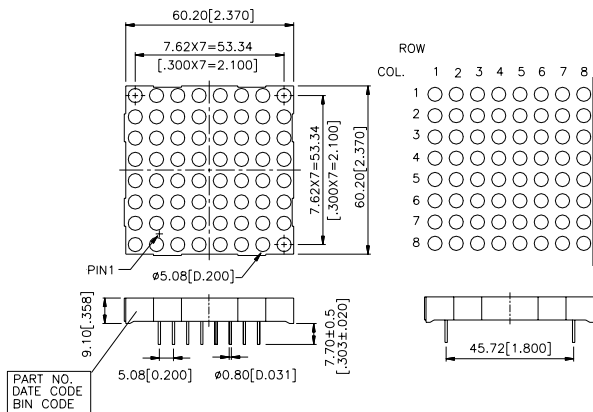
The green series devices utilize LED chips which are made from GaP on a transparent GaP substrate.

The yellow and red orange series devices utilize LED chips which are made from GaAsP on a transparent GaP substrate.

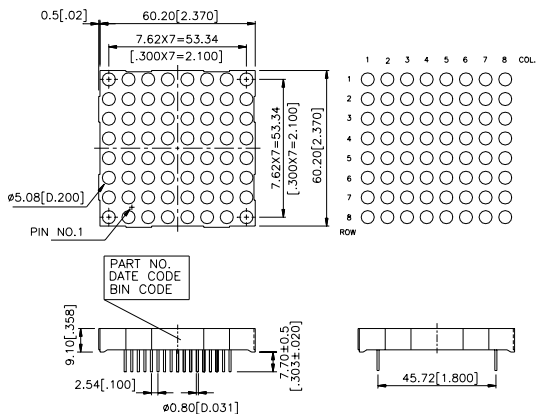
The AlGaAs red series devices utilize LED chips which are made from AlGaAs on a non-transparent GaAs substrate.

#### Package Dimensions

##### A. LTP-2088A



##### B. LTP-2188AA



Notes : All dimensions are in millimeters(inches).  
Tolerance :  $\pm 0.25\text{mm}$  (0.01") unless otherwise noted.

#### Devices

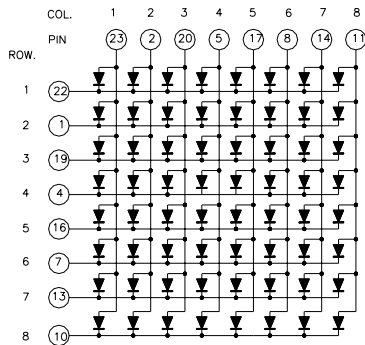
| Part No. LTP- |        |            |            |             | Description               | Package Dimension | Internal Circuit Diagram |
|---------------|--------|------------|------------|-------------|---------------------------|-------------------|--------------------------|
| Green         | Yellow | Red Orange | AlGaAs Red | Multi Color |                           |                   |                          |
| 2088AG        | 2088AY | 2088AE     | 2088AC     | —           | Anode Column, Cathode Row | A                 | A                        |
| —             | —      | —          | —          | 2188AA      | Anode Column, Cathode Row | B                 | B                        |

# Pin Connection

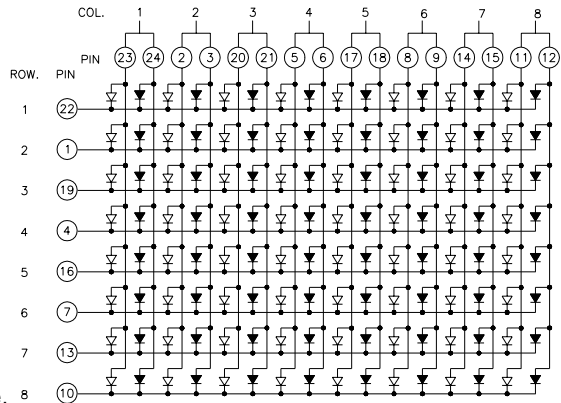
| Pin No. | Connection     |                           |
|---------|----------------|---------------------------|
|         | A. LTP-2088A   | B. LTP-2188AA             |
| 1       | Anode Column 1 | Anode Column 1 Green      |
| 2       | Anode Column 2 | Anode Column 1 Red Orange |
| 3       | Anode Column 3 | Anode Column 2 Green      |
| 4       | Anode Column 4 | Anode Column 2 Red Orange |
| 5       | Cathode Row 5  | Anode Column 3 Green      |
| 6       | Cathode Row 6  | Anode Column 3 Red Orange |
| 7       | Cathode Row 7  | Anode Column 4 Green      |
| 8       | Cathode Row 8  | Anode Column 4 Red Orange |
| 9       | Anode Column 8 | Cathode Row 5 Green       |
| 10      | Anode Column 7 | Cathode Row 5 Red Orange  |
| 11      | Anode Column 6 | Cathode Row 6 Green       |
| 12      | Anode Column 5 | Cathode Row 6 Red Orange  |
| 13      | Cathode Row 4  | Cathode Row 7 Green       |
| 14      | Cathode Row 3  | Cathode Row 7 Red Orange  |
| 15      | Cathode Row 2  | Cathode Row 8 Green       |
| 16      | Cathode Row 1  | Cathode Row 8 Red Orange  |
| 17      |                | Anode Column 8 Green      |
| 18      |                | Anode Column 8 Red Orange |
| 19      |                | Anode Column 7 Green      |
| 20      |                | Anode Column 7 Red Orange |
| 21      |                | Anode Column 6 Green      |
| 22      |                | Anode Column 6 Red Orange |
| 23      |                | Anode Column 5 Green      |
| 24      |                | Anode Column 5 Red Orange |
| 25      |                | Cathode Row 4 Green       |
| 26      |                | Cathode Row 4 Red Orange  |
| 27      |                | Cathode Row 3 Green       |
| 28      |                | Cathode Row 3 Red Orange  |
| 29      |                | Cathode Row 2 Green       |
| 30      |                | Cathode Row 2 Red Orange  |
| 31      |                | Cathode Row 1 Green       |
| 32      |                | Cathode Row 1 Red Orange  |

## Internal Circuit Diagrams

A. LTP-2088A



B. LTP-2188AA



Notes : The Sign "▷▷" stands for Green color dice.  
The Sign "▷▶" stands for Red Orange color dice.

## Absolute Maximum Ratings at Ta=25°C

| Parameter                                                               | Green          | Yellow     | Red Orange | AlGaAs Red | Unit        |
|-------------------------------------------------------------------------|----------------|------------|------------|------------|-------------|
| Average Power Dissipation Per Dot                                       | 36             | 32         | 36         | 36         | mW          |
| Peak Forward Current Per Dot                                            | 100            | 80         | 100        | 125        | mA          |
| Average Forward Current Per Dot<br>Derating Linear from 25°C Per Dot    | 13<br>0.17     | 10<br>0.12 | 13<br>0.17 | 15<br>0.20 | mA<br>mA/°C |
| Reverse Voltage Per Dot                                                 | 5              | 5          | 5          | 5          | V           |
| Operating Temperature Range                                             | -35°C to +85°C |            |            |            |             |
| Storage Temperature Range                                               | -35°C to +85°C |            |            |            |             |
| Solder Temperature 1/16 Inch Below Seating Plane for 3 Seconds at 260°C |                |            |            |            |             |

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

LTP-2088AG/2188AA(Green)

| Parameter                         | Symbol            | Min. | Typ. | Max. | Unit | Test Condition                    |
|-----------------------------------|-------------------|------|------|------|------|-----------------------------------|
| Average Luminous Intensity        | I <sub>v</sub>    | 1780 | 4800 |      | μ cd | I <sub>p</sub> =80mA<br>1/16 Duty |
| Peak Emission Wavelength          | λ <sub>P</sub>    |      | 565  |      | nm   | I <sub>f</sub> =20mA              |
| Spectral Line Half-Width          | Δλ                |      | 30   |      | nm   | I <sub>f</sub> =20mA              |
| Dominant Wavelength               | λ <sub>d</sub>    |      | 569  |      | nm   | I <sub>f</sub> =20mA              |
| Forward Voltage, any Dot          | V <sub>F</sub>    |      | 2.1  | 2.6  | V    | I <sub>f</sub> =20mA              |
|                                   |                   |      | 3.0  | 3.7  | V    | I <sub>f</sub> =80mA              |
| Reverse Current, any Dot          | I <sub>R</sub>    |      |      | 100  | μ A  | V <sub>R</sub> =5V                |
| Luminous Intensity Matching Ratio | I <sub>v</sub> -m |      |      | 2:1  |      | I <sub>f</sub> =10mA              |

LTP-2088AY

| Parameter                         | Symbol            | Min. | Typ. | Max. | Unit | Test Condition                    |
|-----------------------------------|-------------------|------|------|------|------|-----------------------------------|
| Average Luminous Intensity        | I <sub>v</sub>    | 1780 | 4800 |      | μ cd | I <sub>p</sub> =80mA<br>1/16 Duty |
| Peak Emission Wavelength          | λ <sub>P</sub>    |      | 585  |      | nm   | I <sub>f</sub> =20mA              |
| Spectral Line Half-Width          | Δλ                |      | 35   |      | nm   | I <sub>f</sub> =20mA              |
| Dominant Wavelength               | λ <sub>d</sub>    |      | 588  |      | nm   | I <sub>f</sub> =20mA              |
| Forward Voltage, any Dot          | V <sub>F</sub>    |      | 2.1  | 2.6  | V    | I <sub>f</sub> =20mA              |
|                                   |                   |      | 2.6  | 3.4  | V    | I <sub>f</sub> =80mA              |
| Reverse Current, any Dot          | I <sub>R</sub>    |      |      | 100  | μ A  | V <sub>R</sub> =5V                |
| Luminous Intensity Matching Ratio | I <sub>v</sub> -m |      |      | 2:1  |      | I <sub>f</sub> =10mA              |

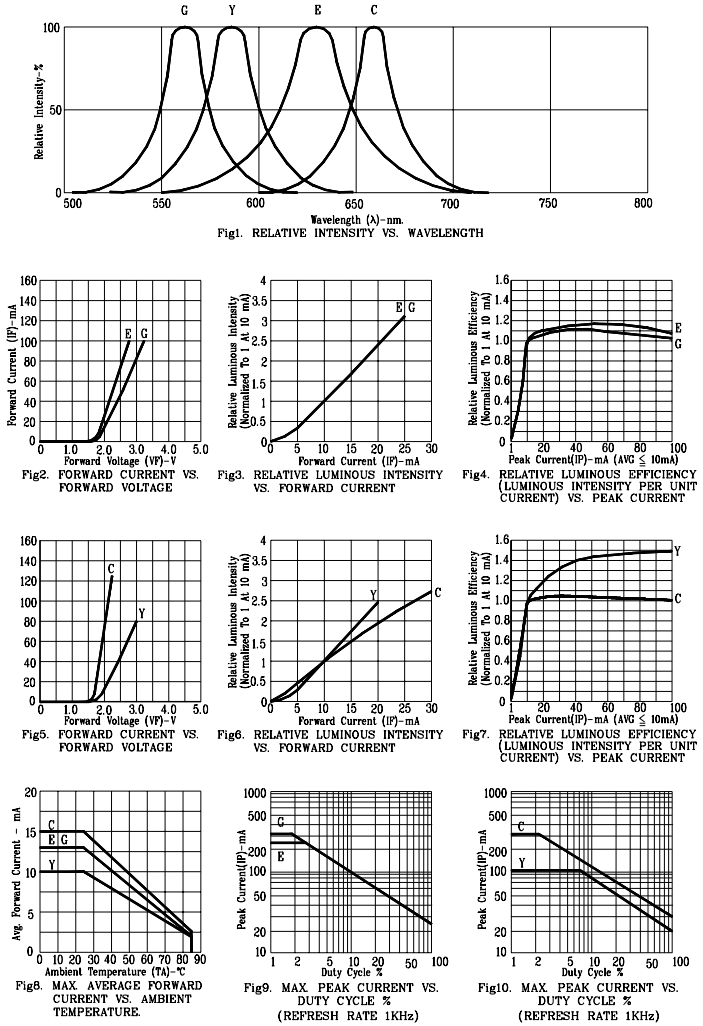
LTP-2088AE/2188AA(Red Orange)

| Parameter                         | Symbol            | Min. | Typ. | Max. | Unit | Test Condition                    |
|-----------------------------------|-------------------|------|------|------|------|-----------------------------------|
| Average Luminous Intensity        | I <sub>v</sub>    | 1780 | 4800 |      | μ cd | I <sub>p</sub> =80mA<br>1/16 Duty |
| Peak Emission Wavelength          | λ <sub>P</sub>    |      | 630  |      | nm   | I <sub>f</sub> =20mA              |
| Spectral Line Half-Width          | Δλ                |      | 40   |      | nm   | I <sub>f</sub> =20mA              |
| Dominant Wavelength               | λ <sub>d</sub>    |      | 621  |      | nm   | I <sub>f</sub> =20mA              |
| Forward Voltage, any Dot          | V <sub>F</sub>    |      | 2.0  | 2.6  | V    | I <sub>f</sub> =20mA              |
|                                   |                   |      | 2.6  | 3.4  | V    | I <sub>f</sub> =80mA              |
| Reverse Current, any Dot          | I <sub>R</sub>    |      |      | 100  | μ A  | V <sub>R</sub> =5V                |
| Luminous Intensity Matching Ratio | I <sub>v</sub> -m |      |      | 2:1  |      | I <sub>f</sub> =10mA              |

| Parameter                         | Symbol            | Min. | Typ.  | Max. | Unit | Test Condition                    |
|-----------------------------------|-------------------|------|-------|------|------|-----------------------------------|
| Average Luminous Intensity        | I <sub>v</sub>    | 6300 | 12000 |      | μ cd | I <sub>p</sub> =80mA<br>1/16 Duty |
| Peak Emission Wavelength          | λ <sub>P</sub>    |      | 660   |      | nm   | I <sub>f</sub> =20mA              |
| Spectral Line Half-Width          | Δλ                |      | 35    |      | nm   | I <sub>f</sub> =20mA              |
| Dominant Wavelength               | λ <sub>d</sub>    |      | 638   |      | nm   | I <sub>f</sub> =20mA              |
| Forward Voltage, any Dot          | V <sub>F</sub>    |      | 1.8   | 2.4  | V    | I <sub>f</sub> =20mA              |
|                                   |                   |      | 2.0   | 2.7  | V    | I <sub>f</sub> =80mA              |
| Reverse Current, any Dot          | I <sub>R</sub>    |      |       | 100  | μ A  | V <sub>R</sub> =5V                |
| Luminous Intensity Matching Ratio | I <sub>v</sub> -m |      |       | 2:1  |      | I <sub>f</sub> =10mA              |

Note: Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commision Internationale De L'Eclairage) eye-response curve.

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



NOTE: G=GREEN E=RED ORANGE C=AlGaAs RED Y=YELLOW (REFRESH RATE 1KHz)