



# LTP- 2088A 2188AA SERIES

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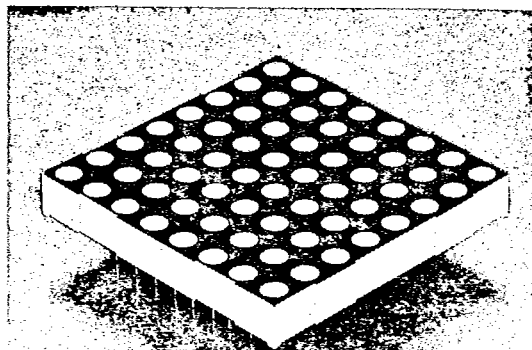
T-41-35

TAIWAN LITON ELECTRONIC

2.3" 8 x 8 SINGLE COLOR & MULTICOLOR  
DOT MATRIX DISPLAYS

## FEATURES

- 2.3" INCH (58.42mm) MATRIX HEIGHT.
- LOW POWER REQUIREMENT.
- HIGH CONTRAST.
- HIGH BRIGHTNESS.
- SINGLE PLANE, WIDE VIEWING ANGLE.
- 8 x 8 ARRAY WITH X-Y SELECT.
- COMPATIBLE WITH USASCII AND EBCDIC CODES.
- STACKABLE VERTICALLY AND HORIZONTALLY.
- CHOICE OF TWO MATRIX ORIENTATION CATHODE ROW OR CATHODE COLUMN.
- EASY MOUNTING ON P.C. BOARD.
- CATEGORIZED FOR LUMINOUS INTENSITY.
- SINGLE COLOR DISPLAYS HAVE THE CHOICE OF FOUR BRIGHT COLORS-GREEN / YELLOW / ORANGE / HIGH EFFICIENCY RED.
- MULTICOLOR DISPLAYS ARE APPLICABLE TO THREE BRIGHT COLORS: GREEN, ORANGE AND YELLOW (GREEN AND ORANGE MIXED)



## DESCRIPTION

The LTP-2x88A series are 1.2 inch (30.48mm) matrix-height 5 x 7 dot matrix displays.

The LTP-2188AA are multicolor applicable displays. The multicolor displays have gray face and white dot color.

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

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

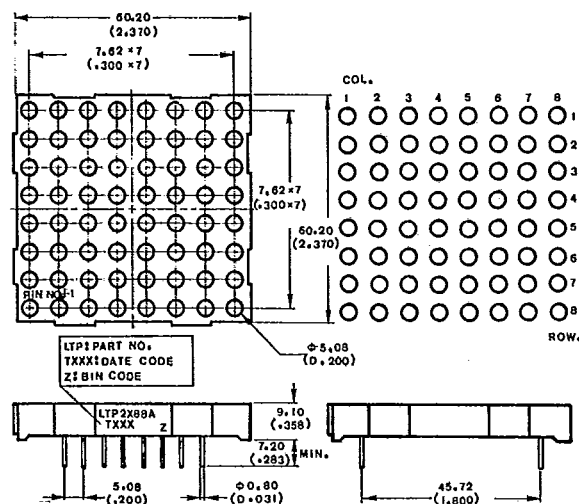
The yellow, orange and high efficiency red series devices utilize LED chips which are made from GaAsP on a transparent GaP substrate.

## DEVICES

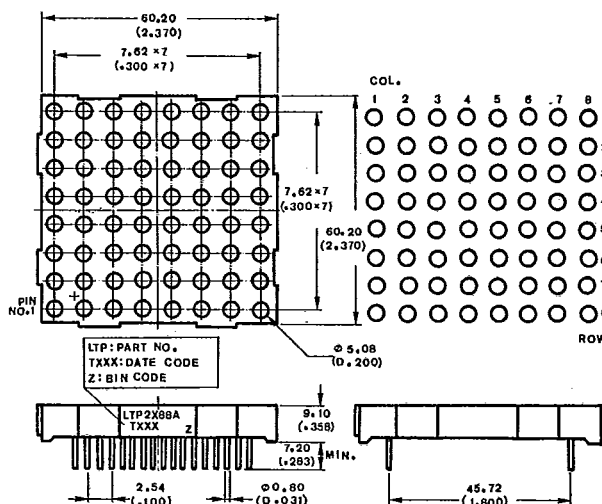
| PART NO. LTP- |        |        |             |             | DESCRIPTION               | PACKAGE DIMENSION | INTERNAL CIRCUIT DIAGRAM |
|---------------|--------|--------|-------------|-------------|---------------------------|-------------------|--------------------------|
| GREEN         | YELLOW | ORANGE | HI-EFF. RED | MULTI-COLOR |                           |                   |                          |
| 2088AG        | 2088AY | 2088AE | 2088AHR     | —           | Anode Column, Cathode Row | A                 | A                        |
| —             | —      | —      | —           | 2188AA      | Anode Column, Cathode Row | B                 | B                        |

## PACKAGE DIMENSIONS

A. LTP-2088A



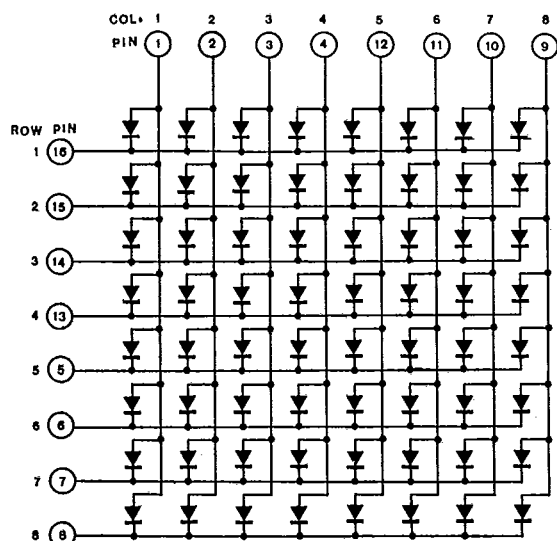
B. LTP-2188AA



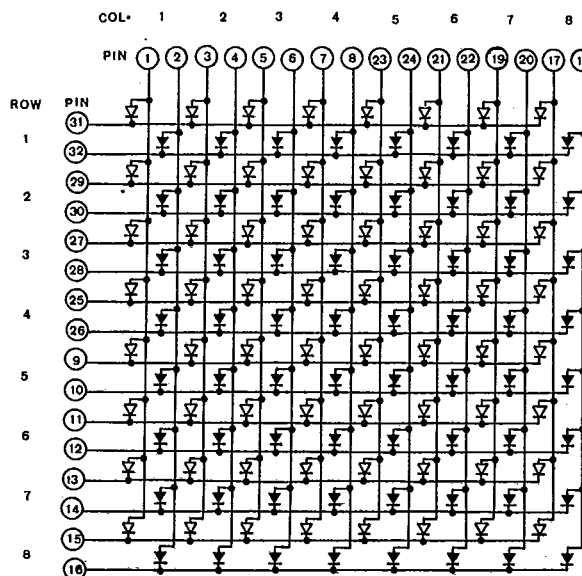
NOTE: All dimensions are in  $\frac{\text{millimeters}}{(\text{inches})}$ , tolerance is  $\frac{0.25\text{mm}}{(0.010'')}$  unless otherwise noted.

## INTERNAL CIRCUIT DIAGRAM

A. LTP-2088A



B. LTP-2188AA



NOTES: 1. The sign "  $\triangle$  " stands for GREEN color dice.  
2. The sign "  $\blacktriangleright$  " stands for ORANGE color dice.

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DOT MATRIX DISPLAYS

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## PIN CONNECTION

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

ABSOLUTE MAXIMUM RATINGS AT  $T_A = 25^\circ\text{C}$ 

| PARAMETER                                                                | GREEN          | YELLOW | ORANGE | HI-EFF<br>RED | UNIT  |
|--------------------------------------------------------------------------|----------------|--------|--------|---------------|-------|
| Power Dissipation Per Segment                                            | 75             | 60     | 75     | 75            | mW    |
| Peak Forward Current Per Segment<br>(1/10 Duty Cycle, 0.1ms Pulse Width) | 100            | 80     | 100    | 100           | mA    |
| Continuous Forward Current Per Segment                                   | 25             | 20     | 25     | 25            | mA    |
| Derating Linear From 25°C Per Segment                                    | 0.3            | 0.24   | 0.3    | 0.3           | mA/°C |
| Reverse Voltage Per Segment                                              | 5              | 5      | 5      | 5             | V     |
| Operating Temperature Range                                              | -25°C to +85°C |        |        |               |       |
| Storage Temperature Range                                                | -25°C to +85°C |        |        |               |       |
| Solder Temperature 1/16 inch Below Seating Plane for 3 Sec. at 260°C     |                |        |        |               |       |

# ELECTRICAL/OPTICAL CHARACTERISTICS AT $T_A = 25^\circ\text{C}$ LTP-2088AG/2188AA (GREEN)

| PARAMETER                            | SYMBOL          | MIN. | TYP. | MAX. | UNIT           | TEST CONDITION                   |
|--------------------------------------|-----------------|------|------|------|----------------|----------------------------------|
| Average Luminous Intensity           | $I_v$           | 900  | 4000 |      | $\mu\text{cd}$ | $I_p = 48\text{ mA}$<br>1/8 DUTY |
| Peak Emission Wavelength             | $\lambda_p$     |      | 565  |      | nm             | $I_F = 20\text{ mA}$             |
| Spectral Line Half-Width             | $\Delta\lambda$ |      | 30   |      | nm             | $I_F = 20\text{ mA}$             |
| Forward Voltage, any Segment or D.P. | $V_F$           |      | 2.1  | 2.8  | V              | $I_F = 20\text{ mA}$             |
| Reverse Current, any Segment or D.P. | $I_R$           |      |      | 100  | $\mu\text{A}$  | $V_R = 5\text{ V}$               |
| Luminous Intensity Matching Ratio    | $I_v\text{-m}$  |      |      | 2:1  |                | $I_F = 20\text{ mA}$             |

Note: The BIN brightness classification see page 5-70, LTP-2088AG categorize D and LTP-2188A categorize D-1.

## TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES

( $25^\circ\text{C}$  Ambient Temperature Unless Otherwise Noted)

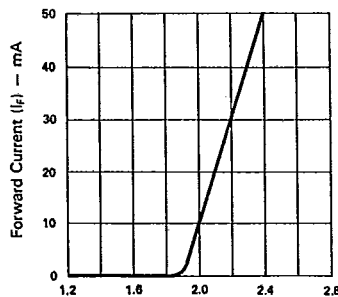


Fig. 1 FORWARD CURRENT Vs. FORWARD VOLTAGE.

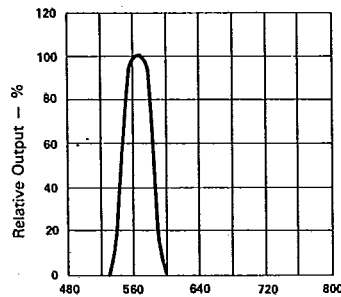


Fig. 2 SPECTRAL RESPONSE.

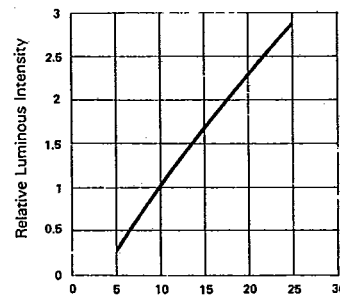


Fig. 3 RELATIVE LUMINOUS INTENSITY Vs. FORWARD CURRENT (PER SEGMENT).

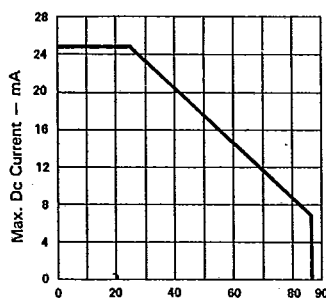


Fig. 4 MAX. ALLOWABLE DC CURRENT PER SEG. Vs AMBIENT TEMPERATURE.

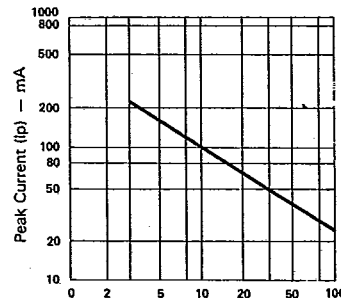


Fig. 5 MAX. PEAK CURRENT Vs. DUTY CYCLE.% (REFRESH RATE -  $F = 1\text{ KHz}$ )

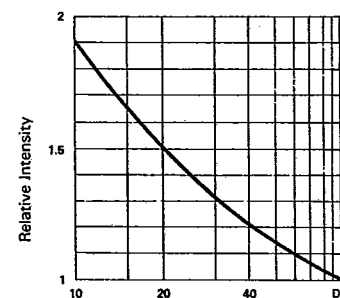


Fig. 6 LUMINOUS INTENSITY Vs. DUTY CYCLE% (AVERAGE  $I_F = 10\text{ mA}$  PER SEG.)

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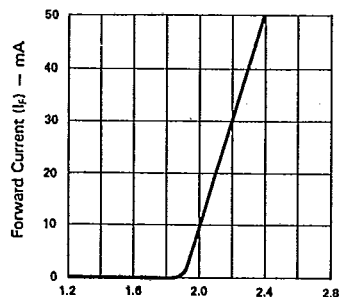
# ELECTRICAL/OPTICAL CHARACTERISTICS AT $T_A = 25^\circ\text{C}$ LTP-2088AY

| PARAMETER                            | SYMBOL          | MIN. | TYP. | MAX. | UNIT           | TEST CONDITION                   |
|--------------------------------------|-----------------|------|------|------|----------------|----------------------------------|
| Average Luminous Intensity           | $I_v$           | 900  | 4000 |      | $\mu\text{cd}$ | $I_p = 48\text{ mA}$<br>1/8 DUTY |
| Peak Emission Wavelength             | $\lambda_p$     |      | 585  |      | nm             | $I_F = 20\text{ mA}$             |
| Spectral Line Half-Width             | $\Delta\lambda$ |      | 35   |      | nm             | $I_F = 20\text{ mA}$             |
| Forward Voltage, any Segment or D.P. | $V_F$           |      | 2.1  | 2.8  | V              | $I_F = 20\text{ mA}$             |
| Reverse Current, any Segment or D.P. | $I_R$           |      |      | 100  | $\mu\text{A}$  | $V_R = 5\text{ V}$               |
| Luminous Intensity Matching Ratio    | $I_v\text{-m}$  |      |      | 2:1  |                | $I_F = 20\text{ mA}$             |

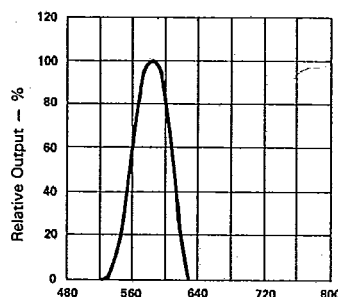
Note: The BIN brightness classification see page 5-70, category D

## TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES

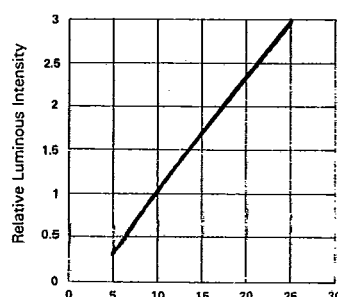
( $25^\circ\text{C}$  Ambient Temperature Unless Otherwise Noted)



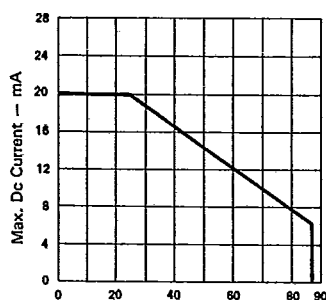
Forward Voltage ( $V_F$ ) — Volts  
Fig. 1 FORWARD CURRENT Vs. FORWARD VOLTAGE.



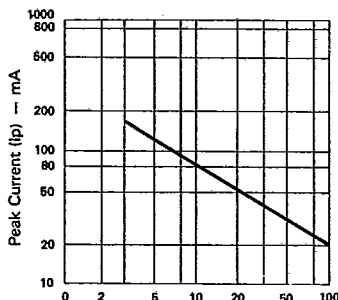
Wavelength ( $\lambda$ ) — nm.  
Fig. 2 SPECTRAL RESPONSE.



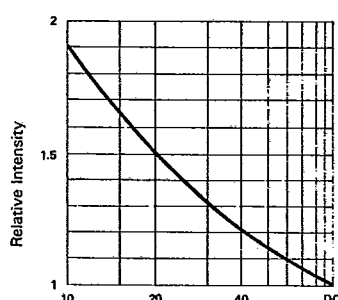
Forward Current ( $I_F$ ) — mA  
Fig. 3 RELATIVE LUMINOUS INTENSITY Vs. FORWARD CURRENT (PER SEGMENT).



Ambient Temperature ( $T_A$ ) —  $^\circ\text{C}$   
Fig. 4 MAX. ALLOWABLE DC CURRENT PER SEG. Vs AMBIENT TEMPERATURE.



Duty Cycle %  
Fig. 5 MAX. PEAK CURRENT Vs. DUTY CYCLE.% (REFRESH RATE —  $F = 1\text{ KHz}$ )



Duty Cycle %  
Fig. 6 LUMINOUS INTENSITY Vs. DUTY CYCLE.% (AVERAGE  $I_F = 10\text{ mA}$  PER SEG.)

# ELECTRICAL/OPTICAL CHARACTERISTICS AT $T_A = 25^\circ\text{C}$ LTP-2088AHR

| PARAMETER                            | SYMBOL          | MIN. | TYP. | MAX. | UNIT           | TEST CONDITION                    |
|--------------------------------------|-----------------|------|------|------|----------------|-----------------------------------|
| Average Luminous Intensity           | $I_v$           | 900  | 4000 |      | $\mu\text{cd}$ | $I_p = 48 \text{ mA}$<br>1/8 DUTY |
| Peak Emission Wavelength             | $\lambda_p$     |      | 635  |      | nm             | $I_F = 20 \text{ mA}$             |
| Spectral Line Half-Width             | $\Delta\lambda$ |      | 40   |      | nm             | $I_F = 20 \text{ mA}$             |
| Forward Voltage, any Segment or D.P. | $V_F$           |      | 2.1  | 2.8  | V              | $I_F = 20 \text{ mA}$             |
| Reverse Current, any Segment or D.P. | $I_R$           |      |      | 100  | $\mu\text{A}$  | $V_R = 5 \text{ V}$               |
| Luminous Intensity Matching Ratio    | $I_v\text{-m}$  |      |      | 2:1  |                | $I_F = 20 \text{ mA}$             |

Note: The BIN brightness classification see page 5-70, category D

## TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES

( $25^\circ\text{C}$  Ambient Temperature Unless Otherwise Noted)

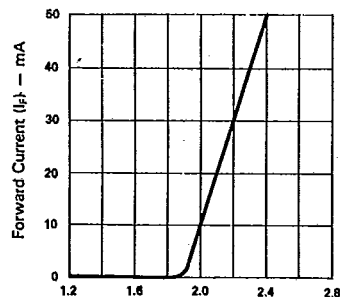


Fig. 1 FORWARD CURRENT Vs. FORWARD VOLTAGE.

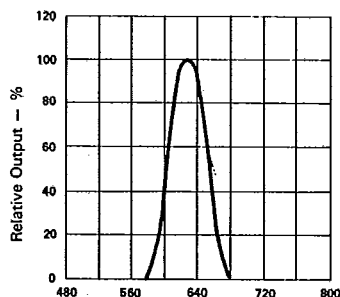


Fig. 2 SPECTRAL RESPONSE.

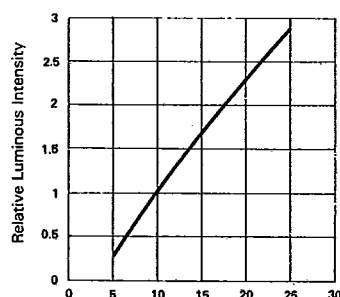


Fig. 3 RELATIVE, LUMINOUS INTENSITY Vs. FORWARD CURRENT (PER SEGMENT).

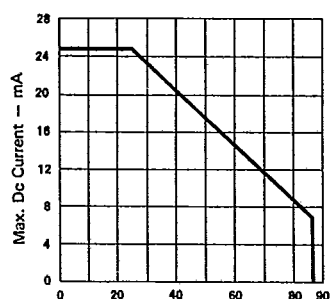


Fig. 4 MAX. ALLOWABLE DC CURRENT PER SEG. Vs AMBIENT TEMPERATURE.

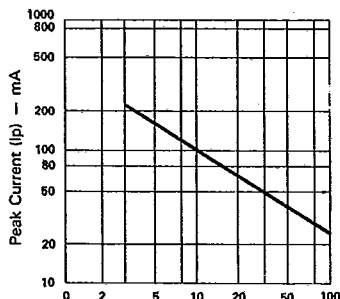


Fig. 5 MAX. PEAK CURRENT Vs. DUTY CYCLE.% (REFRESH RATE -  $F = 1 \text{ KHz}$ )

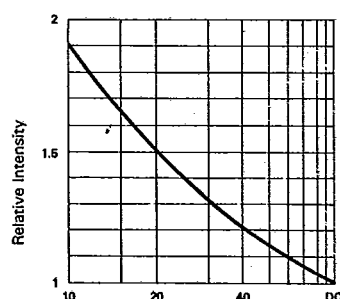


Fig. 6 LUMINOUS INTENSITY Vs. DUTY CYCLE% (AVERAGE  $I_F = 10 \text{ mA}$  PER SEG.)

# ELECTRICAL/OPTICAL CHARACTERISTICS AT $T_A = 25^\circ\text{C}$ LTP-2088AE/2188AA (ORANGE)

| PARAMETER                            | SYMBOL          | MIN. | TYP. | MAX. | UNIT           | TEST CONDITION                   |
|--------------------------------------|-----------------|------|------|------|----------------|----------------------------------|
| Average Luminous Intensity           | $I_v$           | 900  | 4000 |      | $\mu\text{cd}$ | $I_F = 48\text{ mA}$<br>1/8 DUTY |
| Peak Emission Wavelength             | $\lambda_p$     |      | 630  |      | nm             | $I_F = 20\text{ mA}$             |
| Spectral Line Half-Width             | $\Delta\lambda$ |      | 40   |      | nm             | $I_F = 20\text{ mA}$             |
| Forward Voltage, any Segment or D.P. | $V_F$           |      | 2.1  | 2.8  | V              | $I_F = 20\text{ mA}$             |
| Reverse Current, any Segment or D.P. | $I_R$           |      |      | 100  | $\mu\text{A}$  | $V = 5\text{ V}$                 |
| Luminous Intensity Matching Ratio    | $I_v\text{-m}$  |      |      | 2:1  |                | $I_F = 20\text{ mA}$             |

Note: The BIN brightness classification see page 5-70, LTP-2088AE categorize D and LTP-2188AA categorize D-1.

## TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES

( $25^\circ\text{C}$  Ambient Temperature Unless Otherwise Noted)

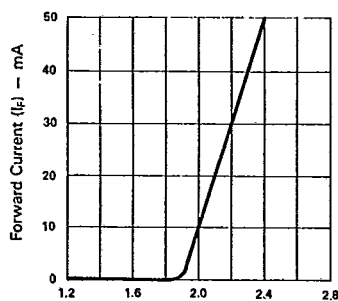


Fig. 1 FORWARD CURRENT Vs. FORWARD VOLTAGE.

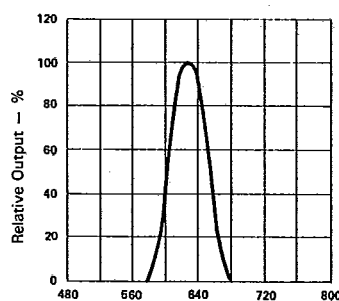


Fig. 2 SPECTRAL RESPONSE.

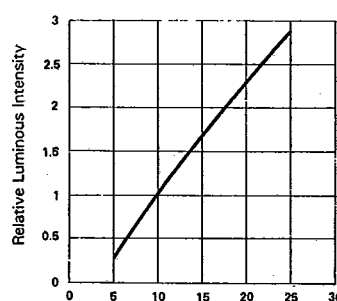


Fig. 3 RELATIVE, LUMINOUS INTENSITY Vs. FORWARD CURRENT (PER SEGMENT).

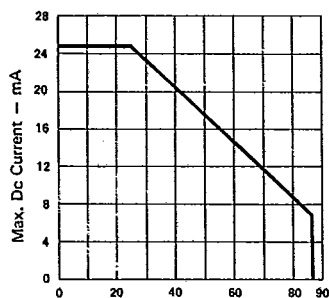


Fig. 4 MAX. ALLOWABLE DC CURRENT PER SEG. Vs AMBIENT TEMPERATURE.

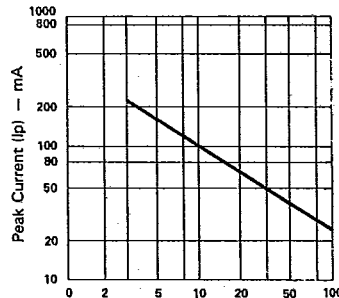


Fig. 5 MAX. PEAK CURRENT Vs. DUTY CYCLE. (REFRESH RATE -  $F = 1\text{ KHz}$ )

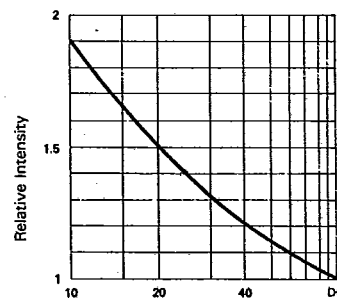


Fig. 6 LUMINOUS INTENSITY Vs. DUTY CYCLE% (AVERAGE  $I_F = 10\text{ mA}$  PER SEG.)

ALPHANUMERIC DISPLAYS &  
DOT MATRIX DISPLAYS

# ELECTRICAL/OPTICAL CHARACTERISTICS AT $T_A = 25^\circ\text{C}$ LTP-2088AHR

| PARAMETER                            | SYMBOL          | MIN. | TYP. | MAX. | UNIT           | TEST CONDITION                    |
|--------------------------------------|-----------------|------|------|------|----------------|-----------------------------------|
| Average Luminous Intensity           | $I_v$           | 900  | 4000 |      | $\mu\text{cd}$ | $I_p = 48 \text{ mA}$<br>1/8 DUTY |
| Peak Emission Wavelength             | $\lambda_p$     |      | 635  |      | nm             | $I_F = 20 \text{ mA}$             |
| Spectral Line Half-Width             | $\Delta\lambda$ |      | 40   |      | nm             | $I_F = 20 \text{ mA}$             |
| Forward Voltage, any Segment or D.P. | $V_F$           |      | 2.1  | 2.8  | V              | $I_F = 20 \text{ mA}$             |
| Reverse Current, any Segment or D.P. | $I_R$           |      |      | 100  | $\mu\text{A}$  | $V_R = 5 \text{ V}$               |
| Luminous Intensity Matching Ratio    | $I_v\text{-m}$  |      |      | 2:1  |                | $I_F = 20 \text{ mA}$             |

Note: The BIN brightness classification see page 5-70, category D

## TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES

( $25^\circ\text{C}$  Ambient Temperature Unless Otherwise Noted)

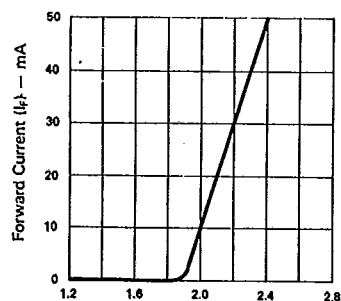


Fig. 1 FORWARD CURRENT Vs. FORWARD VOLTAGE.

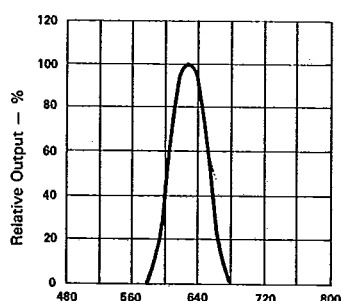


Fig. 2 SPECTRAL RESPONSE.

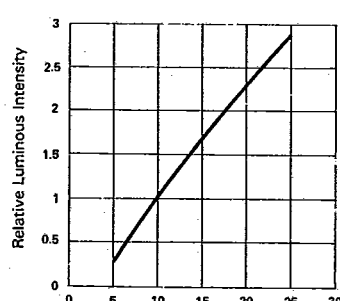


Fig. 3 RELATIVE, LUMINOUS INTENSITY Vs. FORWARD CURRENT (PER SEGMENT).

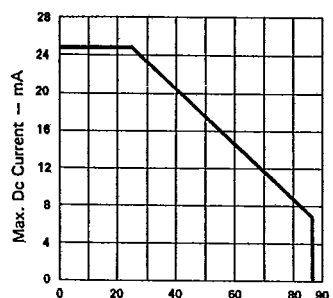


Fig. 4 MAX. ALLOWABLE DC CURRENT PER SEG. Vs AMBIENT TEMPERATURE.

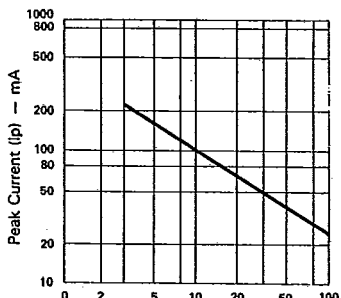


Fig. 5 MAX. PEAK CURRENT Vs. DUTY CYCLE. (REFRESH RATE -  $F = 1 \text{ KHz}$ )

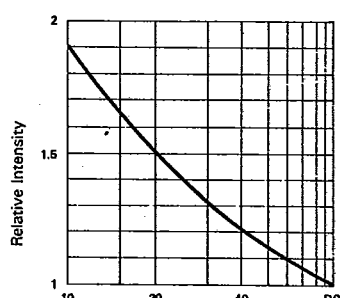


Fig. 6 LUMINOUS INTENSITY Vs. DUTY CYCLE% (AVERAGE  $I_F = 10 \text{ mA}$  PER SEG.)