

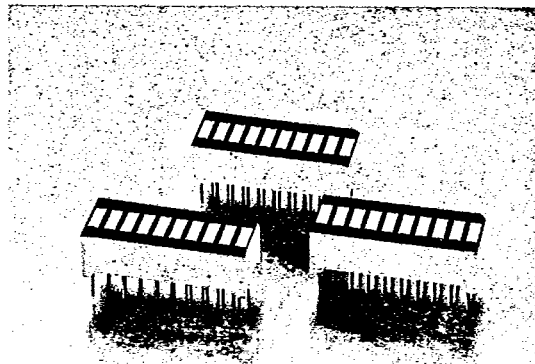


## LTA-1000 SERIES

### BAR GRAPH ARRAY

#### FEATURES

- LARGE SEGMENTS, CLOSELY SPACED.
- CHOICE OF SIX BRIGHT COLORS-RED/BRIGHT RED / GREEN / YELLOW / ORANGE / HIGH EFFICIENCY RED.
- END STACKABLE.
- FAST SWITCHING, EXCELLENT FOR MULTIPLEXING.
- LOW POWER REQUIREMENT.
- IC COMPATIBLE.
- WIDE VIEWING ANGLE.
- CATEGORIZED FOR LUMINOUS INTENSITY.
- EASY MOUNTING ON P.C. BOARD OR SOCKETS.



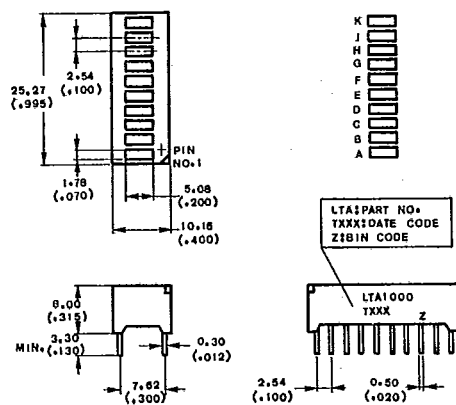
#### DESCRIPTION

The LTA-1000 series are ten rectangular light sources array displays designed for a variety of applications where a continuously large, bright source of light is required. The red series devices utilize LED chips which are made from GaAsP on a GaAs substrate. The bright red and 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. The red, bright red, green, yellow, and orange devices have gray face and white segment color. The high efficiency red devices have red face and red segment color.

#### DEVICES

| PART NO. LTA-- |            |       |        |        |              | DESCRIPTION                    |
|----------------|------------|-------|--------|--------|--------------|--------------------------------|
| RED            | BRIGHT RED | GREEN | YELLOW | ORANGE | HI.-EFF. RED |                                |
| 1000R          | 1000P      | 1000G | 1000Y  | 1000E  | 1000HR       | Universal, Ten Rectangular Bar |

## PACKAGE DIMENSIONS



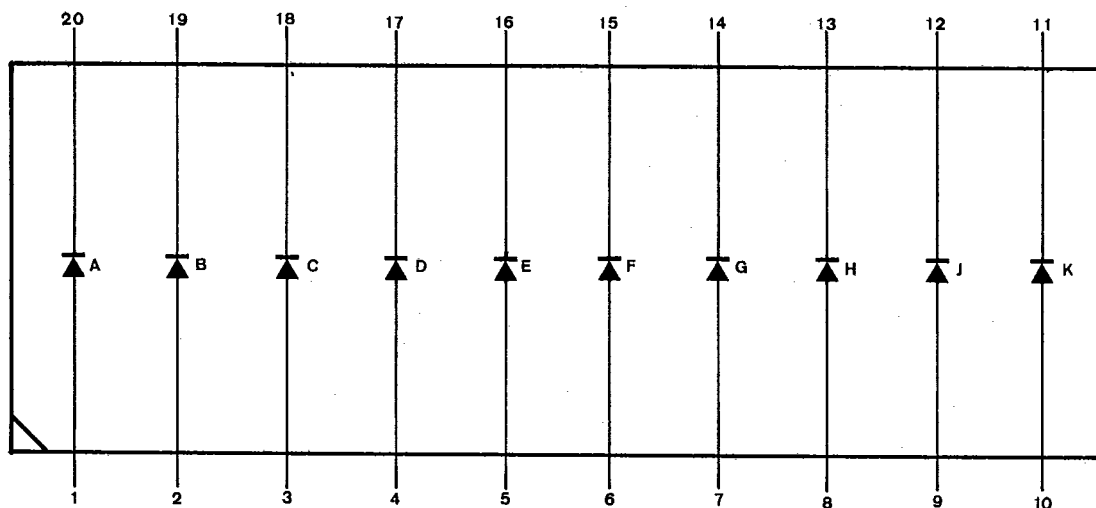
LED LIGHT BARS &  
BAR GRAPH ARRAYS

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

## PIN CONNECTION

| PIN NO. | CONNECTION | PIN NO. | CONNECTION |
|---------|------------|---------|------------|
| 1       | Anode A    | 11      | Cathode K  |
| 2       | Anode B    | 12      | Cathode J  |
| 3       | Anode C    | 13      | Cathode H  |
| 4       | Anode D    | 14      | Cathode G  |
| 5       | Anode E    | 15      | Cathode F  |
| 6       | Anode F    | 16      | Cathode E  |
| 7       | Anode G    | 17      | Cathode D  |
| 8       | Anode H    | 18      | Cathode C  |
| 9       | Anode J    | 19      | Cathode B  |
| 10      | Anode K    | 20      | Cathode A  |

## INTERNAL CIRCUIT DIAGRAM

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

| PARAMETER                                                               | RED            | BRIGHT<br>RED | GREEN | YELLOW | ORANGE | HI.-EFF.<br>RED | UNIT  |
|-------------------------------------------------------------------------|----------------|---------------|-------|--------|--------|-----------------|-------|
| Power Dissipation Per Bar                                               | 55             | 40            | 75    | 60     | 75     | 75              | mW    |
| Peak Forward Current Per Bar<br>(1/10 Duty Cycle, 0.1ms Pulse Width)    | 160            | 60            | 100   | 80     | 100    | 100             | mA    |
| Continuous Forward Current Per Bar                                      | 25             | 15            | 25    | 20     | 25     | 25              | mA    |
| Derating Linear From 25°C Per Bar                                       | 0.3            | 0.18          | 0.3   | 0.24   | 0.3    | 0.3             | mA/°C |
| Reverse Voltage PerBar                                                  | 5              | 5             | 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 Seconds at 260°C |                |               |       |        |        |                 |       |

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

## LTA-1000R

| PARAMETER                         | SYMBOL          | MIN. | TYP. | MAX. | UNIT          | TEST CONDITION       |
|-----------------------------------|-----------------|------|------|------|---------------|----------------------|
| Average Luminous intensity        | $I_v$           | 0.2  | 0.5  |      | mcd           | $I_F = 10\text{ mA}$ |
| Peak Emission Wavelength          | $\lambda_p$     |      | 655  |      | nm            | $I_F = 20\text{ mA}$ |
| Spectral Line Half-Width          | $\Delta\lambda$ |      | 24   |      | nm            | $I_F = 20\text{ mA}$ |
| Forward Voltage any Bar           | $V_F$           |      | 1.7  | 2.0  | V             | $I_F = 20\text{ mA}$ |
| Reverse Current, any Bar          | $I_R$           |      |      | 100  | $\mu\text{A}$ | $V_R = 5\text{V}$    |
| Luminous Intensity Matching Ratio | $I_v\text{-m}$  |      |      | 2:1  |               | $I_F = 20\text{ mA}$ |

LED LIGHT BARS &  
BAR GRAPH ARRAYS

Note: The BIN brightness classification see page 3-24, category A

## TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES

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

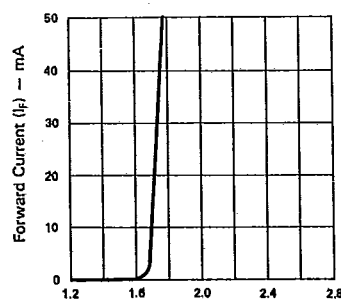


Fig. 1 FORWARD CURRENT Vs. FORWARD VOLTAGE.

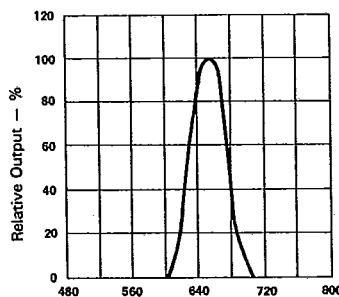


Fig. 2 SPECTRAL RESPONSE.

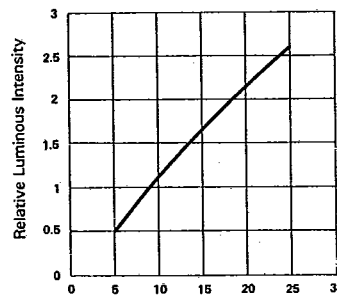


Fig. 3 RELATIVE LUMINOUS INTENSITY Vs. FORWARD CURRENT (PER SEGMENT).

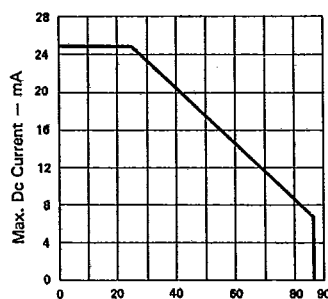


Fig. 4 MAX. ALLOWABLE DC CURRENT PER SEG. Vs AMBIENT TEMPERATURE.

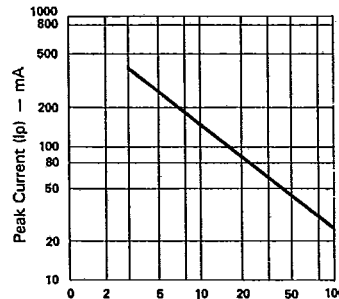


Fig. 5 MAX. PEAK CURRENT Vs. DUTY CYCLE.% (REFRESH RATE -  $F = 1\text{ KHz}$ )

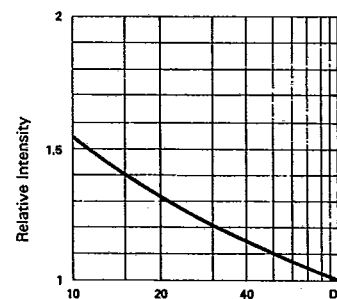


Fig. 6 LUMINOUS INTENSITY Vs. DUTY CYCLE% (AVERAGE  $I_F = 10\text{mA PER SEG.}$ )

# ELECTRICAL/OPTICAL CHARACTERISTICS AT $T_A = 25^\circ\text{C}$ LTA-1000P

| PARAMETER                         | SYMBOL          | MIN. | TYP. | MAX. | UNIT          | TEST CONDITION       |
|-----------------------------------|-----------------|------|------|------|---------------|----------------------|
| Average Luminous Intensity        | $I_v$           | 0.3  | 0.7  |      | mcd           | $I_F = 10\text{ mA}$ |
| Peak Emission Wavelength          | $\lambda_p$     |      | 697  |      | nm            | $I_F = 20\text{ mA}$ |
| Spectral Line Half-Width          | $\Delta\lambda$ |      | 90   |      | nm            | $I_F = 20\text{ mA}$ |
| Forward Voltage any Bar           | $V_F$           |      | 2.1  | 2.8  | V             | $I_F = 20\text{ mA}$ |
| Reverse Current, any Bar          | $I_R$           |      |      | 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 3-24, category A

## TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES

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

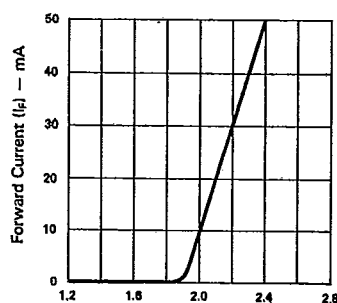


Fig. 1 FORWARD CURRENT Vs. FORWARD VOLTAGE.

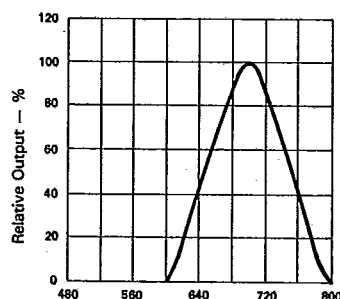


Fig. 2 SPECTRAL RESPONSE.

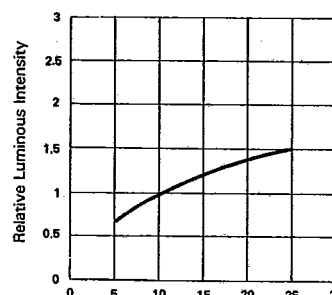


Fig. 3 RELATIVE LUMINOUS INTENSITY Vs. FORWARD CURRENT (PER SEGMENT).

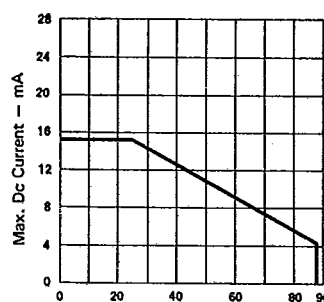


Fig. 4 MAX. ALLOWABLE DC CURRENT PER SEG. Vs AMBIENT TEMPERATURE.

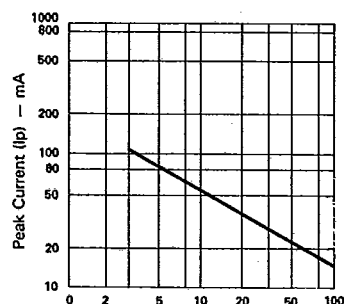


Fig. 5 MAX. PEAK CURRENT Vs. DUTY CYCLE. % (REFRESH RATE -  $F = 1\text{ KHz}$ )

# ELECTRICAL/OPTICAL CHARACTERISTICS AT $T_A = 25^\circ\text{C}$ LTA-1000G

| PARAMETER                         | SYMBOL          | MIN. | TYP. | MAX. | UNIT          | TEST CONDITION       |
|-----------------------------------|-----------------|------|------|------|---------------|----------------------|
| Average Luminous intensity        | $I_v$           | 0.8  | 2.0  |      | mcd           | $I_F = 10\text{ mA}$ |
| 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 Bar           | $V_F$           |      | 2.1  | 2.8  | V             | $I_F = 20\text{ mA}$ |
| Reverse Current, any Bar          | $I_R$           |      |      | 100  | $\mu\text{A}$ | $V_R = 5\text{V}$    |
| Luminous Intensity Matching Ratio | $I_v\text{-m}$  |      |      | 2:1  |               | $I_F = 20\text{ mA}$ |

LED LIGHT BARS &  
BAR GRAPH ARRAYS

Note: The BIN brightness classification see page 3-24, category A

## TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES

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

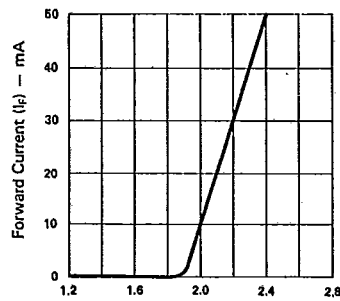


Fig. 1 FORWARD CURRENT Vs. FORWARD VOLTAGE.

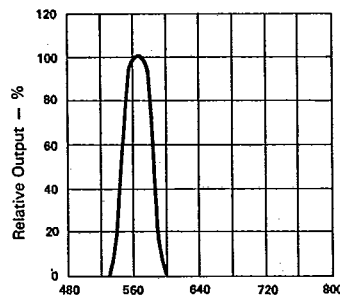


Fig. 2 SPECTRAL RESPONSE.

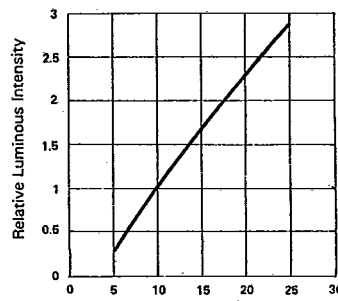


Fig. 3 RELATIVE LUMINOUS INTENSITY Vs. FORWARD CURRENT (PER SEGMENT).

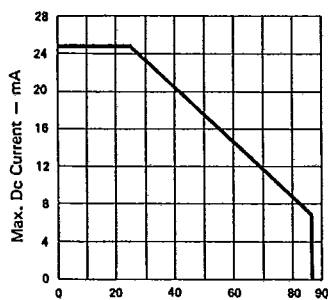


Fig. 4 MAX. ALLOWABLE DC CURRENT PER SEG. Vs AMBIENT TEMPERATURE.

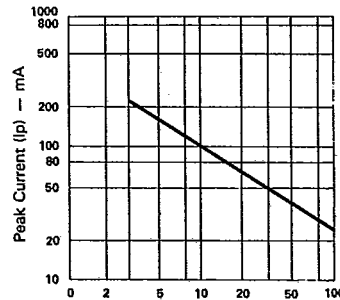


Fig. 5 MAX. PEAK CURRENT Vs. DUTY CYCLE.% (REFRESH RATE -  $F = 1\text{ KHz}$ )

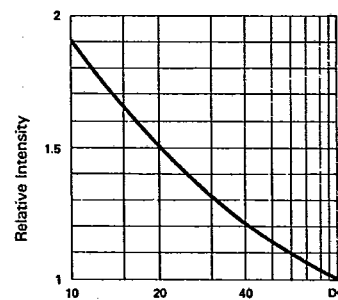


Fig. 6 LUMINOUS INTENSITY Vs. DUTY CYCLE% (AVERAGE  $I_F = 10\text{mA}$  PER SEG.)

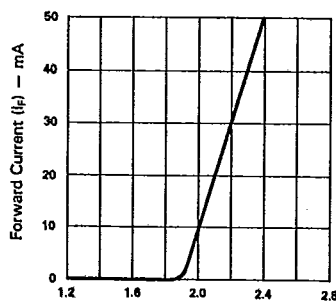
# ELECTRICAL/OPTICAL CHARACTERISTICS AT $T_A = 25^\circ\text{C}$ LTA-1000Y

| PARAMETER                         | SYMBOL          | MIN. | TYP. | MAX. | UNIT          | TEST CONDITION       |
|-----------------------------------|-----------------|------|------|------|---------------|----------------------|
| Average Luminous Intensity        | $I_v$           | 0.8  | 2.0  |      | mcđ           | $I_F = 10\text{ mA}$ |
| 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 Bar           | $V_F$           |      | 2.1  | 2.8  | V             | $I_F = 20\text{ mA}$ |
| Reverse Current, any Bar          | $I_R$           |      |      | 100  | $\mu\text{A}$ | $V_R = 5\text{ V}$   |
| Luminous Intensity Matching Ratio | $I_v\text{-m}$  |      |      | 2:1  |               | $I_F = 20\text{ mA}$ |

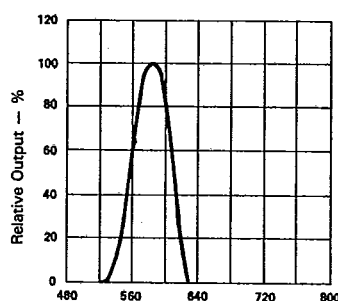
Note: The BIN brightness classification see page 3-24, category A

## TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES

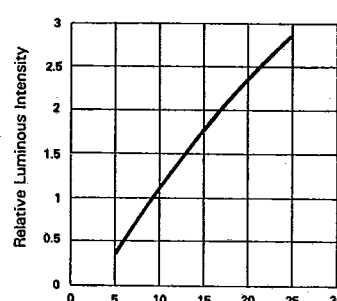
( $25^\circ\text{C}$  Ambient Temperature Unless Otherwise Noted)



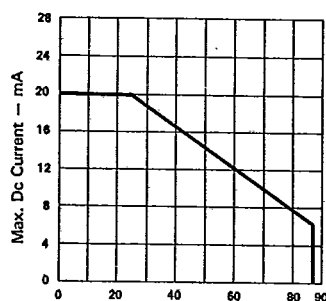
Forward Voltage ( $V_F$ ) — Volts  
Fig. 1 FORWARD CURRENT Vs. FORWARD VOLTAGE.



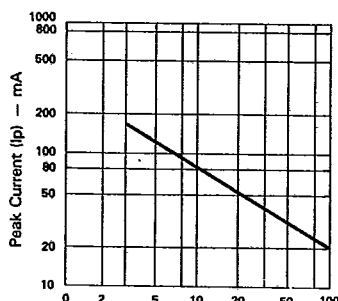
Wavelength ( $\lambda$ ) — nm.  
Fig. 2 SPECTRAL RESPONSE.



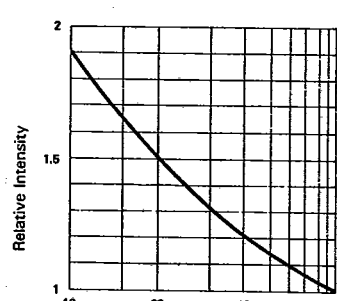
Forward Current ( $I_F$ ) — mA  
Fig. 3 RELATIVE LUMINOUS INTENSITY Vs. FORWARD CURRENT (PER SEGMENT).



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 $T_A = 25^\circ\text{C}$ LTA-1000E

| PARAMETER                         | SYMBOL          | MIN. | TYP. | MAX. | UNIT          | TEST CONDITION       |
|-----------------------------------|-----------------|------|------|------|---------------|----------------------|
| Average Luminous Intensity        | $I_v$           | 0.8  | 2.0  |      | mcđ           | $I_F = 10\text{ mA}$ |
| 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 Bar           | $V_F$           |      | 2.1  | 2.8  | V             | $I_F = 20\text{ mA}$ |
| Reverse Current, any Bar          | $I_R$           |      |      | 100  | $\mu\text{A}$ | $V_R = 5\text{ V}$   |
| Luminous Intensity Matching Ratio | $I_v\text{-m}$  |      |      | 2:1  |               | $I_F = 20\text{ mA}$ |

LED LIGHT BARS &  
BAR GRAPH ARRAYS

Note: The BIN brightness classification see page 3-24, category A

## TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES ( $25^\circ\text{C}$ Ambient Temperature Unless Otherwise Noted)

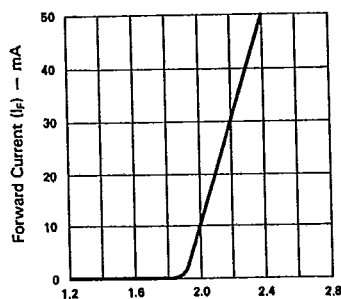


Fig. 1 FORWARD CURRENT Vs. FORWARD VOLTAGE.

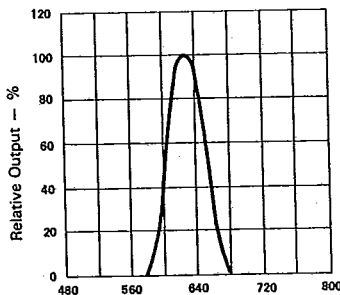


Fig. 2 SPECTRAL RESPONSE.

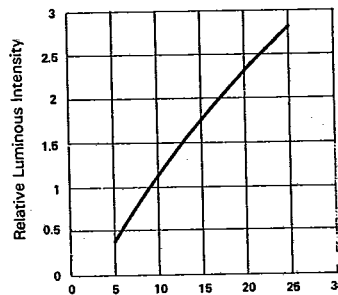


Fig. 3 RELATIVE LUMINOUS INTENSITY Vs. FORWARD CURRENT (PER SEGMENT).

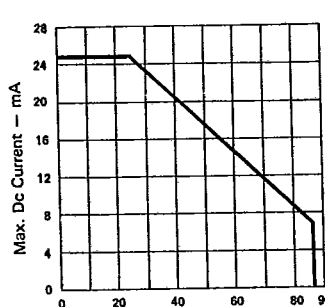


Fig. 4 MAX. ALLOWABLE DC CURRENT PER SEG. Vs AMBIENT TEMPERATURE.

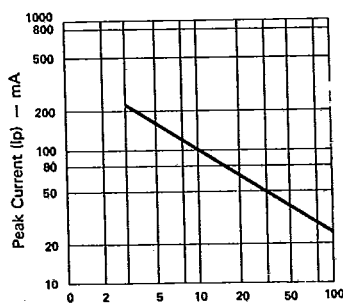


Fig. 5 MAX. PEAK CURRENT Vs. DUTY CYCLE.% (REFRESH RATE -  $F = 1\text{ KHz}$ )

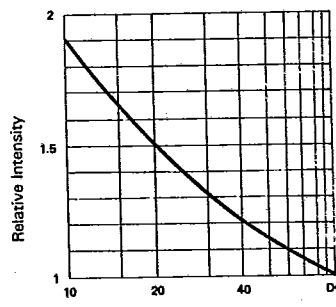


Fig. 6 LUMINOUS INTENSITY Vs. DUTY CYCLE% (AVERAGE  $I_F = 10\text{ mA}$  PER SEG.)

# ELECTRICAL/OPTICAL CHARACTERISTICS AT $T_A = 25^\circ\text{C}$ LTA-1000HR

| PARAMETER                         | SYMBOL          | MIN. | TYP. | MAX. | UNIT          | TEST CONDITION       |
|-----------------------------------|-----------------|------|------|------|---------------|----------------------|
| Average Luminous intensity        | $I_v$           | 0.8  | 2.0  |      | mcd           | $I_F = 10\text{ mA}$ |
| 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 Bar           | $V_F$           |      | 2.1  | 2.8  | V             | $I_F = 20\text{ mA}$ |
| Reverse Current, any Bar          | $I_R$           |      |      | 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 3-24, category A

## TYPICAL ELECTRICAL/OPTICAL CHARACTERISTIC CURVES ( $25^\circ\text{C}$ Ambient Temperature Unless Otherwise Noted)

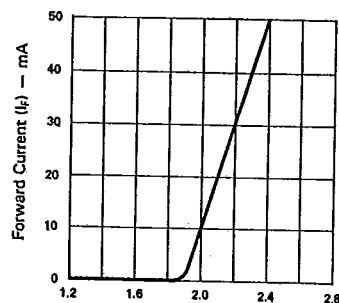


Fig. 1 FORWARD CURRENT Vs. FORWARD VOLTAGE.

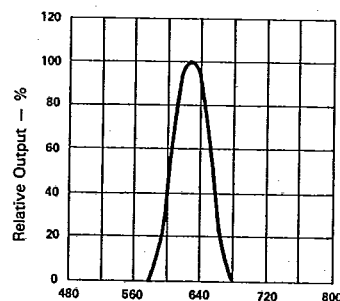


Fig. 2 SPECTRAL RESPONSE.

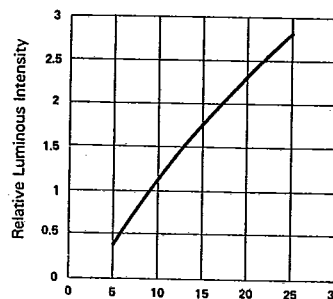


Fig. 3 RELATIVE LUMINOUS INTENSITY Vs. FORWARD CURRENT (PER SEGMENT).

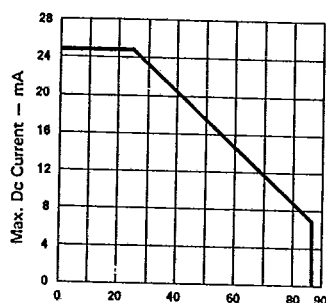


Fig. 4 MAX. ALLOWABLE DC CURRENT PER SEG. Vs AMBIENT TEMPERATURE.

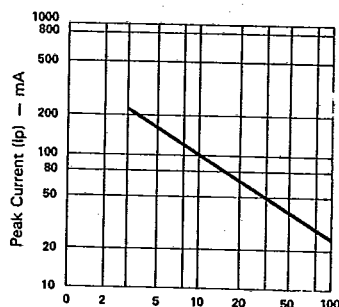


Fig. 5 MAX. PEAK CURRENT Vs. DUTY CYCLE. (REFRESH RATE -  $F = 1\text{ KHz}$ )

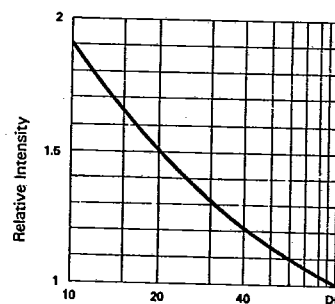


Fig. 6 LUMINOUS INTENSITY Vs. DUTY CYCLE. (AVERAGE  $I_F = 10\text{ mA}$  PER SEG.)

NOTES: 1. Clean only in water, isopropanol, ethanol, freon TF (or equivalent).

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

3. The average luminous intensity is obtained by summing the luminous intensity of each segment and dividing by the total number of segments. The displays are categorized for luminous intensity with the intensity category designated by a letter located on the side of the package. The BIN brightness classification is as follows:

## CATEGORY A:

| BIN CODE                 | A          | B           | C           | D           | E            | F            | G             | H             | J             | K              | L              |
|--------------------------|------------|-------------|-------------|-------------|--------------|--------------|---------------|---------------|---------------|----------------|----------------|
| RANGE ( $\mu\text{cd}$ ) | 68~<br>156 | 104~<br>252 | 168~<br>408 | 272~<br>648 | 432~<br>1044 | 696~<br>1668 | 1112~<br>2832 | 1888~<br>4524 | 3016~<br>7236 | 4820~<br>11568 | 7712~<br>16325 |

## CATEGORY E:

| BIN CODE                 | 3            | 2         | 2            | A          | B            | C           | D             |
|--------------------------|--------------|-----------|--------------|------------|--------------|-------------|---------------|
| RANGE ( $\mu\text{cd}$ ) | 1.2~<br>2.28 | 1.6~<br>3 | 2.08~<br>4.2 | 2.88~<br>6 | 4.08~<br>8.4 | 5.68~<br>12 | 8.08~<br>16.8 |

| BIN CODE                 | E            | F              | G              | H              | J              | K               |
|--------------------------|--------------|----------------|----------------|----------------|----------------|-----------------|
| RANGE ( $\mu\text{cd}$ ) | 11.28~<br>24 | 16.08~<br>33.6 | 22.48~<br>46.8 | 31.28~<br>64.8 | 43.28~<br>91.2 | 60.8~<br>128.04 |

LED LIGHT BARS &  
BAR GRAPH ARRAYS