

20 mm (0.8 inch) Seven Segment Displays

Technical Data

HDSP-340X Series
HDSP-390X Series
HDSP-420X Series
HDSP-860X Series
HDSP-N15X Series

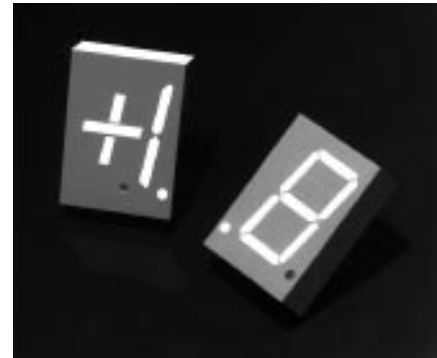
Features

- **Industry Standard Size**
- **Industry Standard Pinout**
15.24 mm (0.6 in.) DIP Leads on 2.54 mm (0.1 in.) Centers
- **Choice of Colors**
Red, AlGaAs Red, High Efficiency Red, Yellow, Green
- **Excellent Appearance**
Evenly Lighted Segments
Mitered Corners on Segments
Gray Package Gives Optimum Contrast
± 50° Viewing Angle
- **Design Flexibility**
Common Anode or Common Cathode
Left and Right Hand Decimal Points
± 1. Overflow Character
- **Categorized for Luminous Intensity**
Yellow and Green Categorized

- for Color
Use of Like Categories Yields a Uniform Display
- **High Light Output**
- **High Peak Current**
- **Excellent for Long Digit String Multiplexing Intensity and Color Selection Option**
See Intensity and Color Selected Displays Data Sheet
- **Sunlight Viewable AlGaAs**

Description

The 20 mm (0.8 inch) LED seven segment displays are designed for viewing distances up to 10 metres (33 feet). These devices use an industry standard size package and pinout. All devices are available as either common anode or common cathode.



These displays are ideal for most applications. Pin for pin equivalent displays are also available in a low current design. The low current displays are ideal for portable applications. For additional information see the Low Current Seven Segment Displays data sheet.

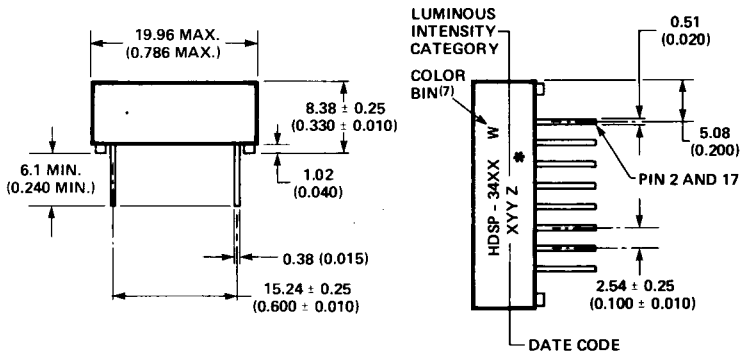
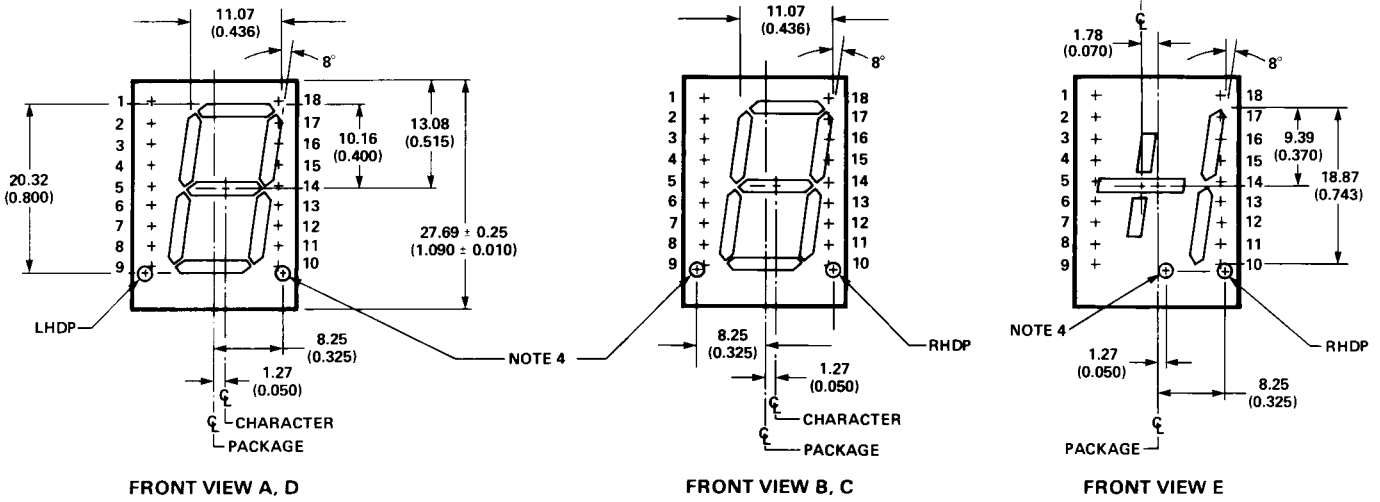
Devices

| Red HDSP- | AlGaAs ^[1] HDSP- | HER HDSP- | Yellow HDSP- | Green HDSP- | Description | Package Drawing |
|-----------|-----------------------------|-----------|--------------|-------------|--|-----------------|
| 3400 | N150 | 3900 | 4200 | 8600 | Common Anode Left Hand Decimal | A |
| 3401 | N151 | 3901 | 4201 | 8601 | Common Anode Right Hand Decimal | B |
| 3403 | N153 | 3903 | 4203 | 8603 | Common Cathode Right Hand Decimal | C |
| 3405 | N155 | 3905 | 4205 | 8605 | Common Cathode Left Hand Decimal | D |
| 3406 | N156 | 3906 | 4206 | 8606 | Universal ± 1. Overflow ^[2] | E |

Notes:

1. These displays are recommended for high ambient light operation. Please refer to the HDSP-N10X AlGaAs data sheet for low current operation.
2. Universal pinout brings the anode and cathode of each segment's LED out to separate pins. See internal diagram E.

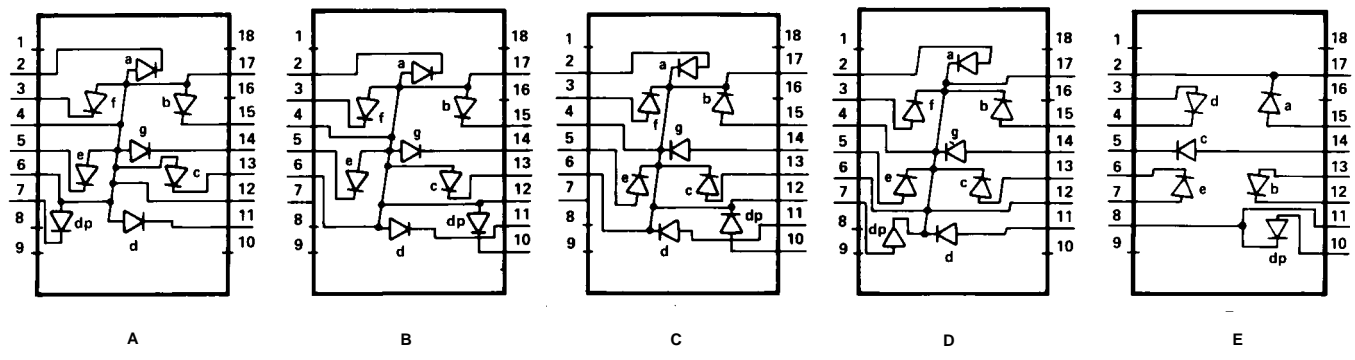
Package Dimensions



| Pin | Function | | | | |
|-----|----------------------|----------------------|------------------------|------------------------|------------|
| | A | B | C | D | E |
| 1 | NO PIN | NO PIN | NO PIN | NO PIN | NO PIN |
| 2 | CATHODE a | CATHODE a | ANODE a | ANODE a | CATHODE a |
| 3 | CATHODE f | CATHODE f | ANODE f | ANODE f | ANODE d |
| 4 | ANODE ^[3] | ANODE ^[3] | CATHODE ^[6] | CATHODE ^[6] | CATHODE d |
| 5 | CATHODE e | CATHODE e | ANODE e | ANODE e | CATHODE c |
| 6 | ANODE ^[3] | ANODE ^[3] | CATHODE ^[6] | CATHODE ^[6] | CATHODE e |
| 7 | CATHODE dp | NO. CONNec. | NO. CONNec. | ANODE dp | ANODE e |
| 8 | NO PIN | NO PIN | NO PIN | NO PIN | CATHODE dp |
| 9 | NO PIN | NO PIN | NO PIN | NO PIN | NO PIN |
| 10 | NO PIN | CATHODE dp | ANODE dp | NO PIN | ANODE dp |
| 11 | CATHODE d | CATHODE d | ANODE d | ANODE d | CATHODE dp |
| 12 | ANODE ^[3] | ANODE ^[3] | CATHODE ^[6] | CATHODE ^[6] | CATHODE b |
| 13 | CATHODE c | CATHODE c | ANODE c | ANODE c | ANODE b |
| 14 | CATHODE g | CATHODE g | ANODE g | ANODE g | ANODE c |
| 15 | CATHODE b | CATHODE b | ANODE b | ANODE b | ANODE a |
| 16 | NO PIN | NO PIN | NO PIN | NO PIN | NO PIN |
| 17 | ANODE ^[3] | ANODE ^[3] | CATHODE ^[6] | CATHODE ^[6] | CATHODE a |
| 18 | NO PIN | NO PIN | NO PIN | NO PIN | NO PIN |

- NOTES:
1. DIMENSIONS IN MILLIMETERS AND (INCHES).
 2. ALL UNTOLERANCED DIMENSIONS ARE FOR REFERENCE ONLY.
 3. REDUNDANT ANODES.
 4. UNUSED dp POSITION.
 5. SEE INTERNAL CIRCUIT DIAGRAM.
 6. REDUNDANT CATHODES.
 7. FOR HDSP-4200/-8600 SERIES PRODUCT ONLY.

Internal Circuit Diagram



Absolute Maximum Ratings

| Description | Red HDSP-3400 Series | AlGaAs Red HDSP-N150 Series | HER HDSP-3900 Series | Yellow HDSP-4200 Series | Green HDSP-8600 Series | Units |
|---|----------------------|-----------------------------|----------------------|-------------------------|------------------------|-------|
| Average Power per Segment or DP | 115 | 96 | 105 | 105 | 105 | mW |
| Peak Forward Current per Segment or DP | 200 ^[1] | 160 ^[3] | 135 ^[5] | 135 ^[5] | 90 ^[7] | mA |
| DC Forward Current per Segment or DP | 50 ^[2] | 40 ^[4] | 40 ^[6] | 40 ^[6] | 30 ^[8] | mA |
| Operating Temperature Range | -40 to +100 | -20 to +100 ^[9] | -40 to +100 | | -40 to +100 | °C |
| Storage Temperature Range | -55 to +100 | | | | | °C |
| Reverse Voltage per Segment or DP | 3.0 | | | | | V |
| Lead Solder Temperature for 3 Seconds (1.60 mm [0.063 in.] below seating plane) | 260 | | | | | °C |

Notes:

- See Figure 1 to establish pulsed conditions.
- Derate above 45°C at 0.83 mA/°C.
- See Figure 2 to establish pulsed conditions.
- Derate above 55°C at 0.8 mA/°C.
- See Figure 7 to establish pulsed conditions.
- Derate above 50°C at 0.73 mA/°C.
- See Figure 8 to establish pulsed conditions.
- Derate above 50°C at 0.54 mA/°C.
- For operation below -20°C, contact your local HP components sales office or an authorized distributor.

Electrical/Optical Characteristics at T_A = 25°C

Red

| Device Series | Parameter | Symbol | Min. | Typ. | Max. | Units | Test Conditions |
|---------------|---|---------------------|------|------|------|-------|-------------------------|
| HDSP-340X | Luminous Intensity/Segment ^[1,2] (Digit Average) | I _V | 500 | 1200 | | μcd | I _F = 20 mA |
| | Forward Voltage/Segment or DP | V _F | | 1.6 | 2.0 | V | I _F = 20 mA |
| | Peak Wavelength | λ _{PEAK} | | 655 | | nm | |
| | Dominant Wavelength ^[3] | λ _d | | 640 | | nm | |
| | Reverse Voltage/Segment or DP ^[4] | V _R | 3.0 | 20 | | V | I _R = 100 μA |
| | Temperature Coefficient of V _F /Segment or DP | ΔV _F /°C | | -2 | | mV/°C | |
| | Thermal Resistance LED Junction-to-Pin | Rθ _{J-PIN} | | 375 | | °C/W | |

AlGaAs Red

| Device Series | Parameter | Symbol | Min. | Typ. | Max. | Units | Test Conditions |
|--|--|-----------------------------|------|------|--------------|-------|-------------------------|
| HDSP-N15X | Luminous Intensity/Segment ^[1,2,5] (Digit Average) | I_V | 6.0 | 14.0 | | mcd | $I_F = 20 \text{ mA}$ |
| | Forward Voltage/Segment or DP | V_F | | 1.8 | | V | $I_F = 20 \text{ mA}$ |
| | | | | 2.0 | 3.0 | V | $I_F = 100 \text{ mA}$ |
| | Peak Wavelength | λ_{PEAK} | | 645 | | nm | |
| | Dominant Wavelength ^[3] | λ_d | | 637 | | nm | |
| | Reverse Voltage/Segment or DP ^[4] | V_R | 3.0 | 15 | | V | $I_R = 100 \mu\text{A}$ |
| | Temperature Coefficient of V_F /Segment or DP | $\Delta V_F/^\circ\text{C}$ | | -2 | | mV/°C | |
| Thermal Resistance LED Junction-to-Pin | $R\theta_{J-PIN}$ | | 430 | | °C/W/ Seg | | |

High Efficiency Red

| Device Series | Parameter | Symbol | Min. | Typ. | Max. | Units | Test Conditions |
|--|--|-----------------------------|------|------|--------------|----------------|--|
| HDSP-390X | Luminous Intensity/Segment ^[1,2] (Digit Average) | I_V | 3350 | 7000 | | μcd | $I_F = 100 \text{ mA Peak: 1 of 5 df}$ |
| | | | | 4800 | | μcd | $I_F = 20 \text{ mA}$ |
| | Forward Voltage/Segment or DP | V_F | | 2.6 | 3.5 | V | $I_F = 100 \text{ mA}$ |
| | Peak Wavelength | λ_{PEAK} | | 635 | | nm | |
| | Dominant Wavelength ^[3] | λ_d | | 626 | | nm | |
| | Reverse Voltage/Segment or DP ^[4] | V_R | 3.0 | 25 | | V | $I_R = 100 \mu\text{A}$ |
| | Temperature Coefficient of V_F /Segment or DP | $\Delta V_F/^\circ\text{C}$ | | -2 | | mV/°C | |
| Thermal Resistance LED Junction-to-Pin | $R\theta_{J-PIN}$ | | 375 | | °C/W/ Seg | | |

Yellow

| Device Series | Parameter | Symbol | Min. | Typ. | Max. | Units | Test Conditions |
|---------------|--|---------------------|-------|------|-------|--------------|--|
| HDSP-420X | Luminous Intensity/Segment ^[1,2] (Digit Average) | I _V | 2200 | 7000 | | μcd | I _F = 100 mA Peak: 1 of 5 df |
| | | | | 3400 | | μcd | I _F = 20 mA |
| | Forward Voltage/Segment or DP | V _F | | 2.6 | 3.5 | V | I _F = 100 mA |
| | Peak Wavelength | λ _{PEAK} | | 583 | | nm | |
| | Dominant Wavelength ^[3,6] | λ _d | 581.5 | 586 | 592.5 | nm | |
| | Reverse Voltage/Segment or DP ^[4] | V _R | 3.0 | 25.0 | | V | I _R = 100 μA |
| | Temperature Coefficient of V _F /Segment or DP | ΔV _F /°C | | -2 | | mV/°C | |
| | Thermal Resistance LED Junction- to-Pin | Rθ _{J-PIN} | | 375 | | °C/W/ Seg | |

Green

| Device Series | Parameter | Symbol | Min. | Typ. | Max. | Units | Test Conditions |
|---------------|--|---------------------|------|------|------|--------------|---|
| HDSP-860X | Luminous Intensity/Segment ^[1,2] (Digit Average) | I _V | 680 | 1500 | | μcd | I _F = 10 mA |
| | | | | 1960 | | μcd | I _F = 50 mA Peak: 1 of 5 df |
| | Forward Voltage/Segment or DP | V _F | | 2.1 | 2.5 | V | I _F = 10 mA |
| | Peak Wavelength | λ _{PEAK} | | 566 | | nm | |
| | Dominant Wavelength ^[3,6] | λ _d | | 571 | 577 | nm | |
| | Reverse Voltage/Segment or DP ^[4] | V _R | 3.0 | 50.0 | | V | I _R = 100 μA |
| | Temperature Coefficient of V _F /Segment or DP | ΔV _F /°C | | -2 | | mV/°C | |
| | Thermal Resistance LED Junction- to-Pin | Rθ _{J-PIN} | | 375 | | °C/W/ Seg | |

Notes:

- Case temperature of the device immediately prior to the intensity measurement is 25°C.
- The digits are categorized for luminous intensity. The intensity category is designated by a letter on the side of the package.
- The dominant wavelength, λ_d, is derived from the CIE chromaticity diagram and is that single wavelength which defines the color of the device.
- Typical specification for reference only. Do not exceed absolute maximum ratings.
- For low current operation, the AlGaAs Red HDSP-N100 series displays are recommended. They are tested at 1 mA dc/segment and are pin for pin compatible with the HDSP-N150 series.
- The Yellow (HDSP-4200) and Green (HDSP-8600) displays are categorized for dominant wavelength. The category is designated by a number adjacent to the luminous intensity category letter.

Red, AlGaAs Red

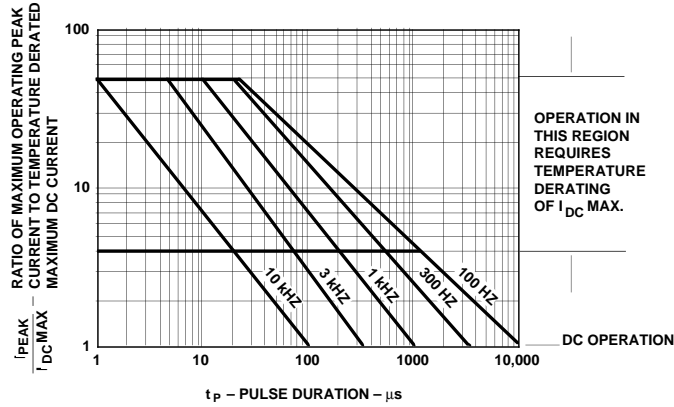


Figure 1. Maximum Allowable Peak Current vs. Pulse Duration - Red.

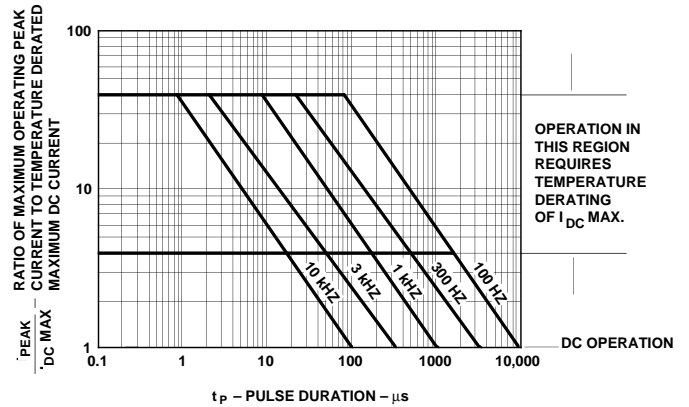


Figure 2. Maximum Allowed Peak Current vs. Pulse Duration - AlGaAs Red.

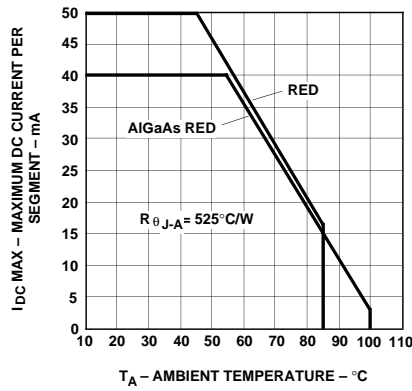


Figure 3. Maximum Allowable DC Current vs. Ambient Temperature.

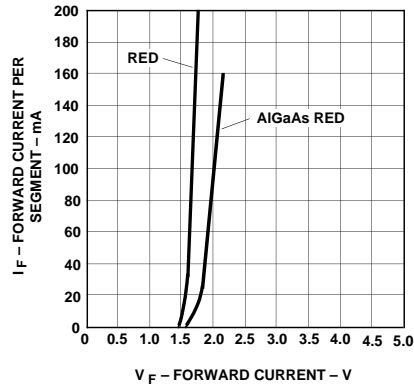


Figure 4. Forward Current vs. Forward Voltage.

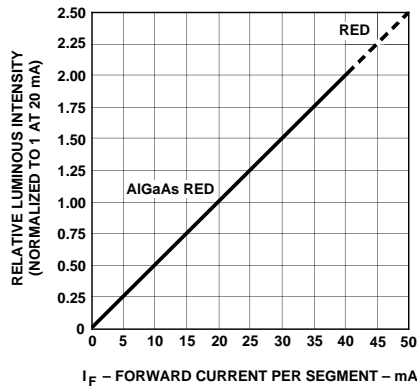


Figure 5. Relative Luminous Intensity vs. DC Forward Current.

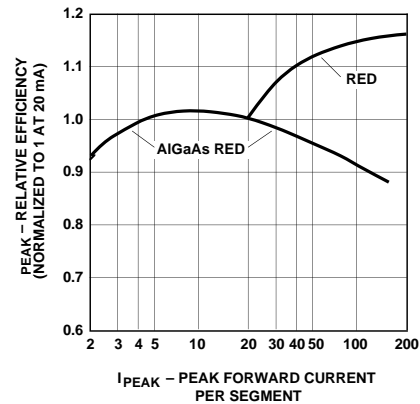


Figure 6. Relative Efficiency (Luminous Intensity per Unit Current) vs. Peak Current.

HER, Yellow, Green

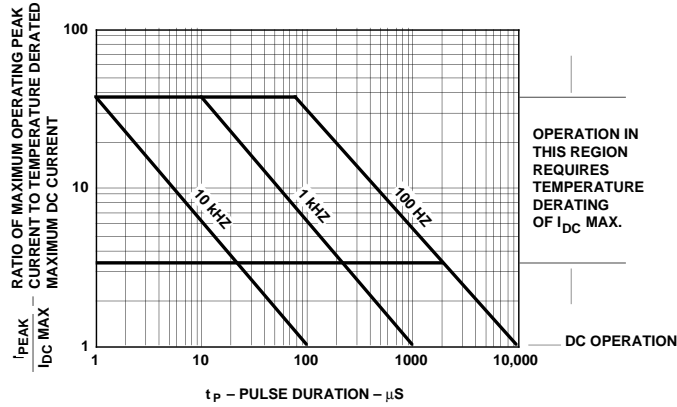


Figure 7. Maximum Allowed Peak Current vs. Pulse Duration - HER, Yellow.

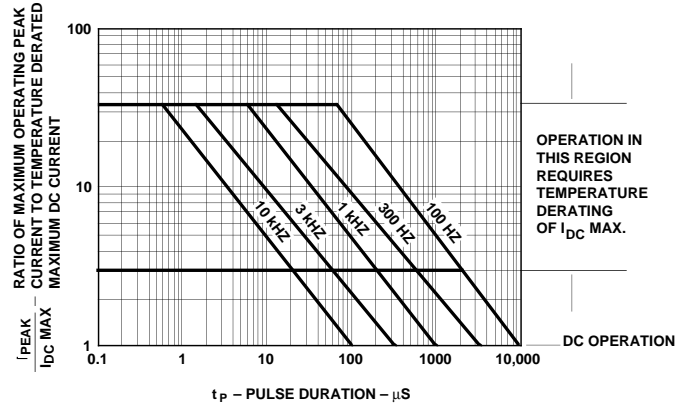


Figure 8. Maximum Allowed Peak Current vs. Pulse Duration - Green.

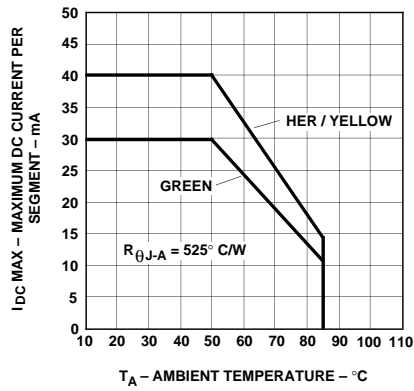


Figure 9. Maximum Allowable DC Current vs. Ambient Temperature.

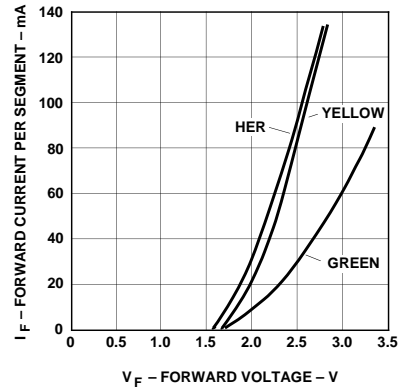


Figure 10. Forward Current vs. Forward Voltage.

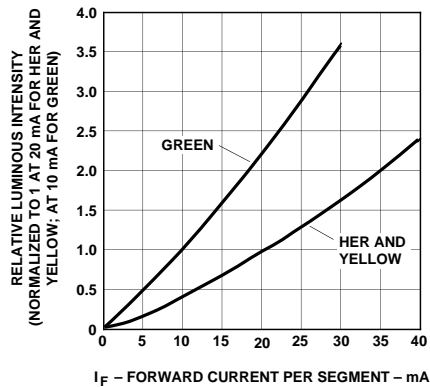


Figure 11. Relative Luminous Intensity vs. DC Forward Current.

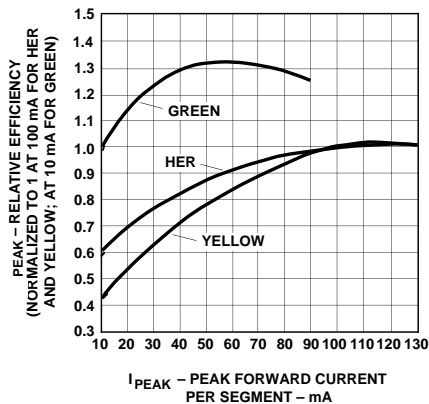


Figure 12. Relative Efficiency (Luminous Intensity per Unit Current) vs. Peak Current.

Contrast Enhancement

For information on contrast enhancement please see Application Note 1015.

Soldering/Cleaning

Cleaning agents from the ketone family (acetone, methyl ethyl ketone, etc.) and from the chlorinated hydrocarbon family (methylene chloride, trichloroethylene, carbon tetrachloride, etc.) are not recommended for cleaning LED parts. All of these various solvents attack or dissolve the encapsulating epoxies used to form the package of plastic LED parts.

For information on soldering LEDs please refer to Application Note 1027.

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