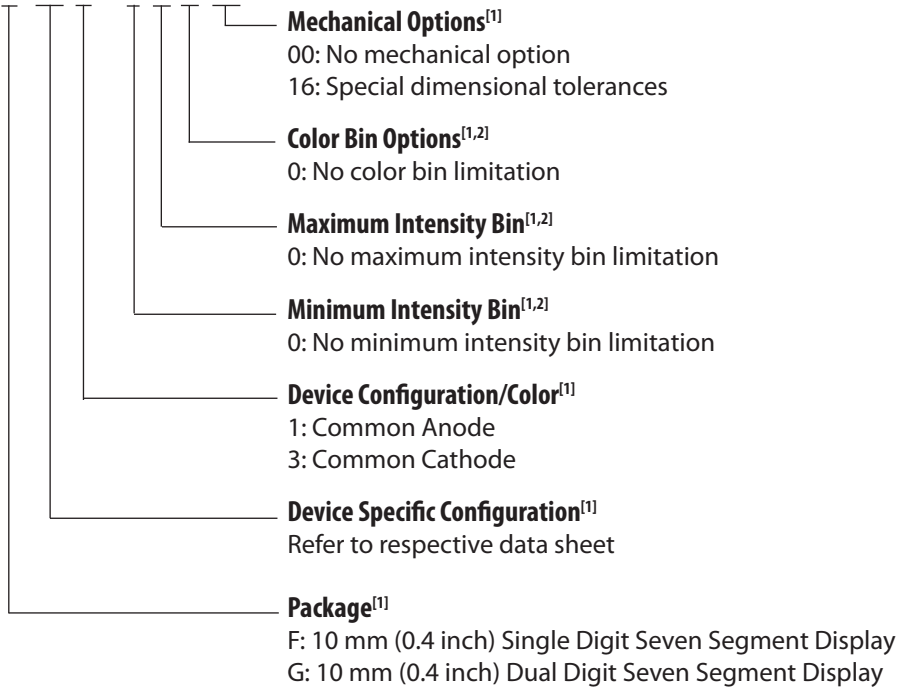


Part Numbering System

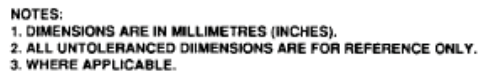
5 0 8 2 - x xx x - x x x xx
 HDSP - x xx x - x x x xx



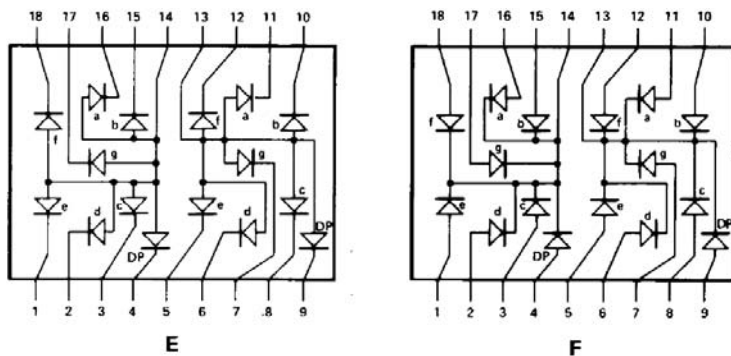
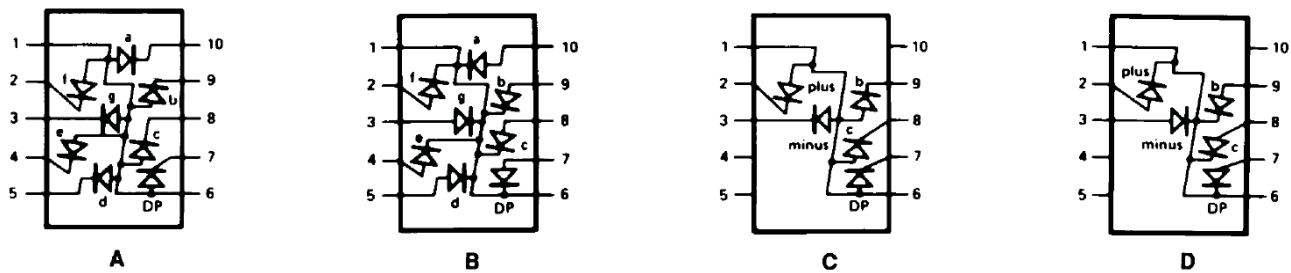
Notes:

1. For codes not listed in the figure above, please refer to the respective data sheet or contact your nearest Avago representative for details.
2. Bin options refer to shippable bins for a part-number. Color and Intensity Bins are typically restricted to 1 bin per tube (exceptions may apply). Please refer to respective data sheet for specific bin limit information.

3



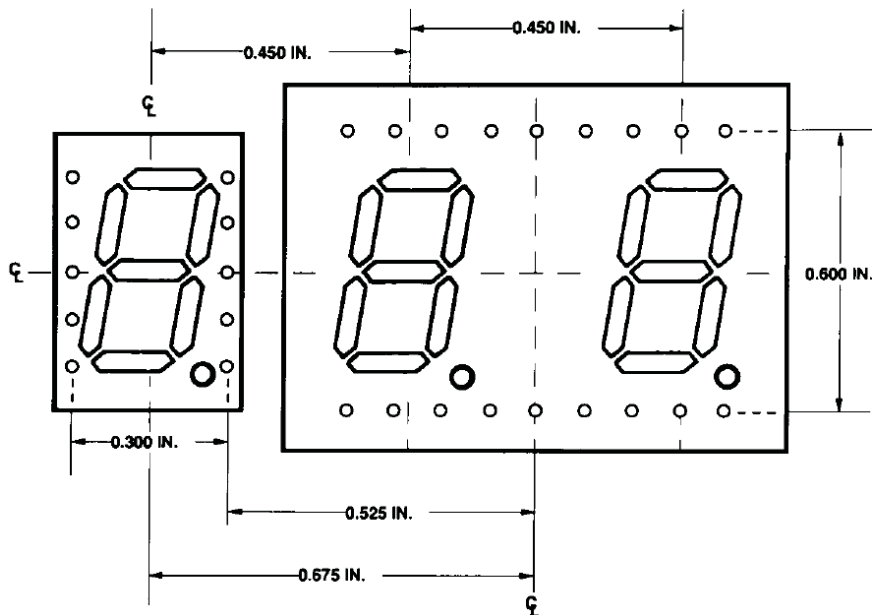
Internal Circuit Diagram



| PIN | FUNCTION | | | |
|-----|----------------------|------------------------|----------------------|------------------------|
| | A | B | C | D |
| 1 | ANODE ^[1] | CATHODE ^[2] | ANODE ^[1] | CATHODE ^[2] |
| 2 | CATHODE f | ANODE f | CATHODE PLUS | ANODE PLUS |
| 3 | CATHODE g | ANODE g | CATHODE MINUS | ANODE MINUS |
| 4 | CATHODE e | ANODE e | NC | NC |
| 5 | CATHODE d | ANODE d | NC | NC |
| 6 | ANODE ^[1] | CATHODE ^[2] | ANODE ^[1] | CATHODE ^[2] |
| 7 | CATHODE DP | ANODE DP | CATHODE DP | ANODE DP |
| 8 | CATHODE c | ANODE c | CATHODE c | ANODE c |
| 9 | CATHODE b | ANODE b | CATHODE b | ANODE b |
| 10 | CATHODE a | ANODE a | NC | NC |

| PIN | FUNCTION | |
|-----|-------------------|---------------------|
| | E | F |
| 1 | E CATHODE NO. 1 | E ANODE NO. 1 |
| 2 | D CATHODE NO. 1 | D ANODE NO. 1 |
| 3 | C CATHODE NO. 1 | C ANODE NO. 1 |
| 4 | DP CATHODE NO. 1 | DP ANODE NO. 1 |
| 5 | E CATHODE NO. 2 | E ANODE NO. 2 |
| 6 | D CATHODE NO. 2 | D ANODE NO. 2 |
| 7 | G CATHODE NO. 2 | G ANODE NO. 2 |
| 8 | C CATHODE NO. 2 | C ANODE NO. 2 |
| 9 | CP CATHODE NO. 2 | DP ANODE NO. 2 |
| 10 | B CATHODE NO. 2 | B ANODE NO. 2 |
| 11 | A CATHODE NO. 2 | A ANODE NO. 2 |
| 12 | F CATHODE NO. 2 | F ANODE NO. 2 |
| 13 | DIGIT NO. 2 ANODE | DIGIT NO. 2 CATHODE |
| 14 | DIGIT NO. 1 ANODE | DIGIT NO. 1 CATHODE |
| 15 | B CATHODE NO. 1 | B ANODE NO. 1 |
| 16 | A CATHODE NO. 1 | A ANODE NO. 1 |
| 17 | G CATHODE NO. 1 | G ANODE NO. 1 |
| 18 | F CATHODE NO. 1 | F ANODE NO. 1 |

NOTES:
1. REDUNDANT ANODES
2. REDUNDANT CATHODES



HOLE PATTERN FOR PCB LAYOUT TO ACHIEVE UNIFORM 0.450 IN. DIGIT TO DIGIT PITCH. FOR HDSP-FXXX TO HDSP-GXXX.

Absolute Maximum Ratings

| Description | AlGaAs Red HDSP- F15x/F16x Series | HER/Orange HDSP- F20x/G20x/ Series | Yellow HDSP- F30x Series | Green HDSP- F50x/G50x Series | Units |
|--|--|---|-----------------------------------|---------------------------------------|-------|
| Average Power per Segment or DP | 96 | 105 | 80 | 105 | mW |
| Peak Forward Current per Segment or DP | 160 ^[1] | 90 ^[3] | 60 ^[5] | 90 ^[7] | mA |
| DC Forward Current per Segment or DP | 40 ^[2] | 30 ^[4] | 20 ^[6] | 30 ^[8] | mA |
| Operating Temperature Range | −20 to +100 ^[9] | | −40 to +100 | | °C |
| Storage Temperature Range | −55 to +100 | | | | °C |
| Reverse Voltage per Segment or DP | 3.0 | | | | V |
| Wavesoldering Temperature for 3 Seconds (1.59 mm [0.063 in.] below body) | 250 | | | | °C |

Notes:

- See Figure 1 to establish pulsed conditions.
- Derate above 46°C at 0.54 mA/°C.
- See Figure 6 to establish pulsed conditions.
- Derate above 53°C at 0.45 mA/°C.
- See Figure 7 to establish pulsed conditions.
- Derate above 81°C at 0.52 mA/°C.
- See Figure 8 to establish pulsed conditions.
- Derate above 39°C at 0.37 mA/°C.
- For operation below -20°C, contact your local Avago components sales office or an authorized distributor.

Electrical/Optical Characteristics at $T_A = 25^\circ\text{C}$

AlGaAs Red

| Device Series | Parameter | Symbol | Min. | Typ. | Max. | Units | Test Conditions |
|----------------|---|-----------------------------|------|------|------|----------|--------------------------------|
| HDSP-F15x/F16x | Luminous Intensity/Segment ^[1,2,5] (Digit Average) | I_V | 7.5 | 15.0 | | mcd | $I_F = 20\text{ mA}$ |
| | Forward Voltage/Segment or DP | V_F | | 1.8 | 2.2 | V | $I_F = 20\text{ mA}$ |
| | 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 | $I_R = 100\text{ }\mu\text{A}$ |
| | Temperature Coefficient of V_F /Segment or DP | $\Delta V_F/^\circ\text{C}$ | | -2 | | mV/°C | |
| | Thermal Resistance LED Junction-to-Pin | $R\theta_{J-PIN}$ | | 320 | | °C/W/Seg | |

Electrical/Optical Characteristics at $T_A = 25^\circ\text{C}$, continued

High Efficiency Red

| Device Series | Parameter | Symbol | Min. | Typ. | Max. | Units | Test Conditions |
|--------------------|--|-----------------------------|------|------|------|------------------------|--------------------------------|
| HDSP-F20x/ G20x | Luminous Intensity/Segment ^[1,2] (Digit Average) | I_V | 420 | 1200 | | μcd | $I_F = 5\text{ mA}$ |
| | Forward Voltage/Segment or DP | V_F | | 2.0 | 2.5 | V | $I_F = 20\text{ mA}$ |
| | Peak Wavelength | λ_{PEAK} | | 635 | | nm | |
| | Dominant Wavelength ^[3] | λ_d | | 626 | | nm | |
| | Reverse Voltage/Segment or DP ^[4] | V_R | 3.0 | 30 | | V | $I_R = 100\text{ }\mu\text{A}$ |
| | Temperature Coefficient of V_F /Segment or DP | $\Delta V_F/^\circ\text{C}$ | | -2 | | mV/ $^\circ\text{C}$ | |
| | Thermal Resistance LED Junction-to-Pin | $R\theta_{J-PIN}$ | | 320 | | $^\circ\text{C/W/Seg}$ | |

Orange

| Device Series | Parameter | Symbol | Min. | Typ. | Max. | Units | Test Conditions |
|---------------|--|-----------------------------|------|------|------|------------------------|--------------------------------|
| HDSP-F40x | Luminous Intensity/Segment ^[1,2] (Digit Average) | I_V | 420 | 1200 | | μcd | $I_F = 5\text{ mA}$ |
| | Forward Voltage/Segment or DP | V_F | | 2.0 | 2.5 | V | $I_F = 20\text{ mA}$ |
| | Peak Wavelength | λ_{PEAK} | | 600 | | nm | |
| | Dominant Wavelength ^[3] | λ_d | | 603 | | nm | |
| | Reverse Voltage/Segment or DP ^[4] | V_R | 3.0 | 30 | | V | $I_R = 100\text{ }\mu\text{A}$ |
| | Temperature Coefficient of V_F /Segment or DP | $\Delta V_F/^\circ\text{C}$ | | -2 | | mV/ $^\circ\text{C}$ | |
| | Thermal Resistance LED Junction-to-Pin | $R\theta_{J-PIN}$ | | 320 | | $^\circ\text{C/W/Seg}$ | |

Electrical/Optical Characteristics at $T_A = 25^\circ\text{C}$, continued

Yellow

| Device Series | Parameter | Symbol | Min. | Typ. | Max. | Units | Test Conditions |
|---------------|--|-----------------------------|-------|------|-------|----------------|--------------------------------|
| HDSP-F30x | Luminous Intensity/Segment ^[1,2] (Digit Average) | I_V | 290 | 800 | | μcd | $I_F = 5\text{ mA}$ |
| | Forward Voltage/Segment or DP | V_F | | 2.2 | 2.5 | V | $I_F = 20\text{ mA}$ |
| | 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 | 40 | | V | $I_R = 100\text{ }\mu\text{A}$ |
| | Temperature Coefficient of V_F /Segment or DP | $\Delta V_F/^\circ\text{C}$ | | -2 | | mV/°C | |
| | Thermal Resistance LED Junction-to-Pin | $R\theta_{\text{J-PIN}}$ | | 320 | | °C/W/Seg | |

High Performance Green

| Device Series | Parameter | Symbol | Min. | Typ. | Max. | Units | Test Conditions |
|--------------------|--|-----------------------------|------|------|------|----------------|--------------------------------|
| HDSP-F50x/ G50x | Luminous Intensity/Segment ^[1,2] (Digit Average) | I_V | 1030 | 3500 | | μcd | $I_F = 10\text{ mA}$ |
| | Forward Voltage/Segment or DP | V_F | | 2.1 | 2.5 | V | $I_F = 10\text{ mA}$ |
| | 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 | | V | $I_R = 100\text{ }\mu\text{A}$ |
| | Temperature Coefficient of V_F /Segment or DP | $\Delta V_F/^\circ\text{C}$ | | -2 | | mV/°C | |
| | Thermal Resistance LED Junction-to-Pin | $R\theta_{\text{J-PIN}}$ | | 320 | | °C/W/Seg | |

Notes:

- Case temperature of 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 HDSP-F10X, G10X series displays are recommended. They are tested at 1 mA dc/segment and are pin for pin compatible with the HDSP-F15X/F16X/G15X series.
- The Yellow (HDSP-F30X/G30X) series and Green (HDSP-F50X/G50X) series displays are categorized for dominant wavelength. The category is designated by a number adjacent to the luminous intensity category letter.

AlGaAs Red

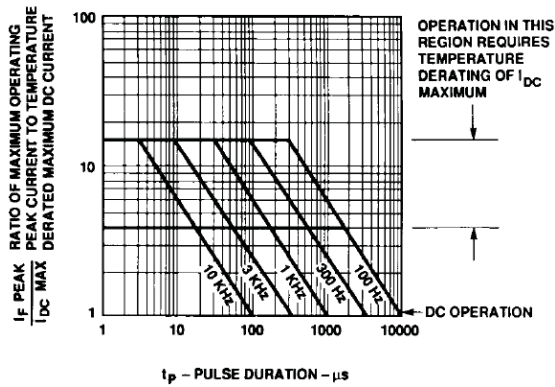


Figure 1. Maximum Tolerable Peak Current vs. Pulse Duration – AlGaAs Red.

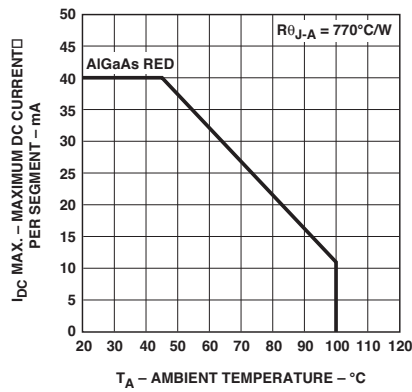


Figure 2. Maximum Allowable DC Current vs. Ambient Temperature.

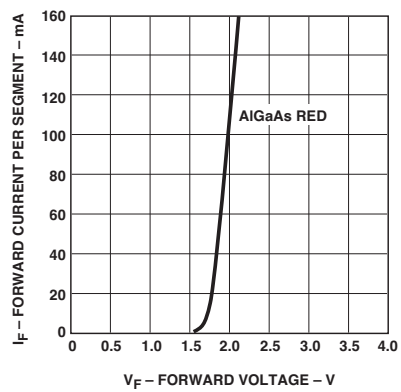


Figure 3. Forward Current vs. Forward Voltage.

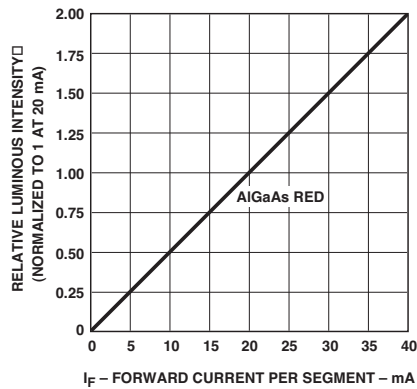


Figure 4. Relative Luminous Intensity vs. DC Forward Current.

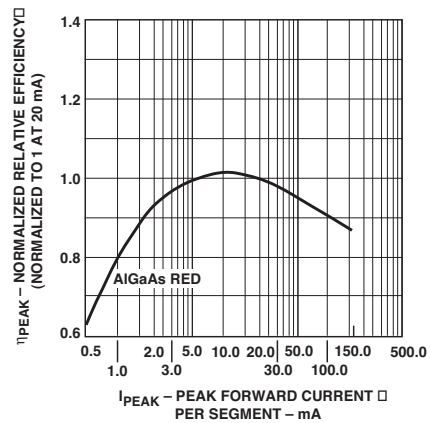


Figure 5. Relative Efficiency (Luminous Intensity per Unit Current) vs. Peak Current.

HER, Orange, Yellow, Green

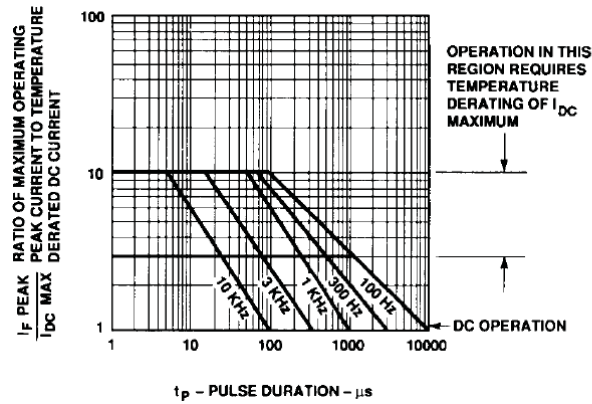


Figure 6. Maximum Tolerable Peak Current vs. Pulse Duration – HER, Orange.

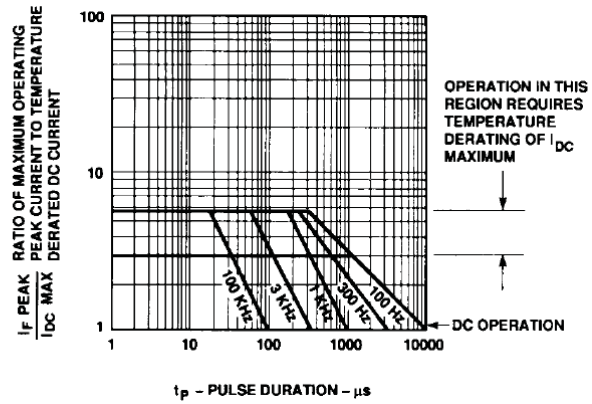


Figure 7. Maximum Tolerable Peak Current vs. Pulse Duration – Yellow.

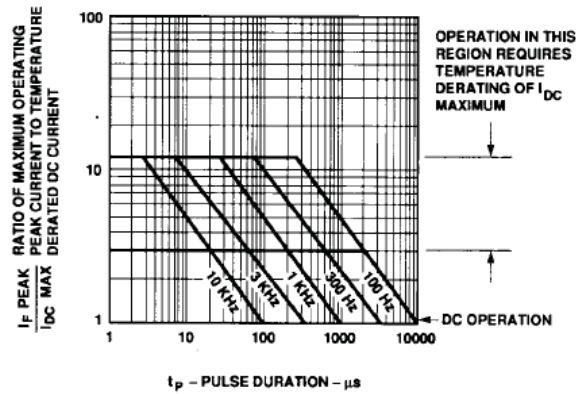


Figure 8. Maximum Tolerable Peak Current vs. Pulse Duration – Green.

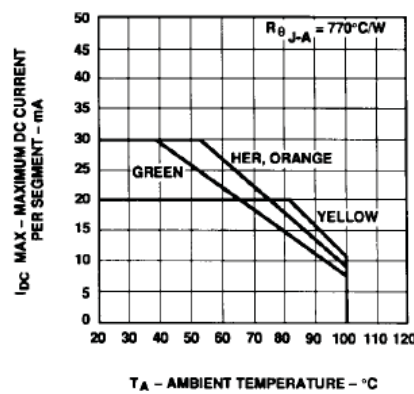


Figure 9. Maximum Allowable DC Current vs. Ambient Temperature.

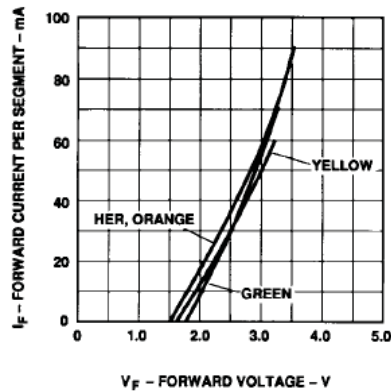


Figure 10. Forward Current vs. Forward Voltage Characteristics.

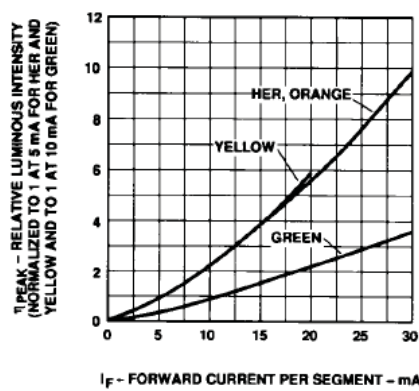


Figure 11. Relative Luminous Intensity vs. DC Forward Current.

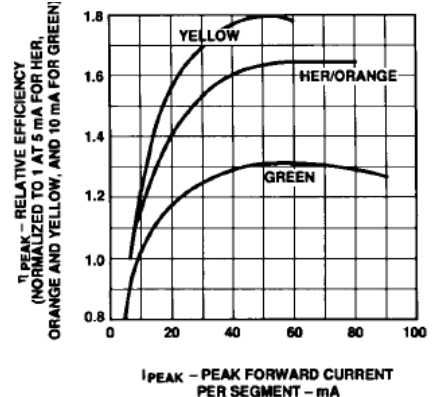


Figure 12. Relative Efficiency (Luminous Intensity per Unit Current) vs. Peak Current.

Intensity Bin Limits (mcd)

AlGaAs Red

| HDSP-F15x/F16x | | |
|-----------------|-------|-------|
| IV Bin Category | Min. | Max. |
| L | 8.67 | 15.90 |
| M | 13.00 | 23.80 |
| N | 19.50 | 35.80 |
| O | 29.30 | 53.60 |
| P | 43.90 | 80.50 |

HER/Orange

| HDSP-F20x/G20x/F40x | | |
|---------------------|-------|-------|
| IV Bin Category | Min. | Max. |
| C | 0.485 | 0.890 |
| D | 0.728 | 1.333 |
| E | 1.091 | 2.000 |
| F | 1.636 | 3.000 |
| G | 2.454 | 4.500 |
| H | 3.682 | 6.751 |

Yellow

| HDSP-F30x | | |
|-----------------|-------|-------|
| IV Bin Category | Min. | Max. |
| C | 0.297 | 0.543 |
| D | 0.445 | 0.817 |
| E | 0.669 | 1.225 |
| F | 1.003 | 1.838 |
| G | 1.504 | 2.758 |
| H | 2.256 | 4.137 |

Green

| HDSP-F50x/G50x | | |
|-----------------|------|-------|
| IV Bin Category | Min. | Max. |
| H | 1.54 | 2.82 |
| I | 2.31 | 4.23 |
| J | 3.46 | 6.34 |
| K | 5.18 | 9.50 |
| L | 7.78 | 14.26 |

Color Categories

| Color | Bin | Dominant Wavelength (nm) | |
|--------|-----|--------------------------|--------|
| | | Min. | Max. |
| Yellow | 1 | 581.50 | 585.00 |
| | 3 | 584.00 | 587.50 |
| | 2 | 586.50 | 590.00 |
| | 4 | 589.00 | 592.50 |
| Green | 2 | 573.00 | 577.00 |
| | 3 | 570.00 | 574.00 |
| | 4 | 567.00 | 571.00 |
| | 5 | 564.00 | 568.00 |

Note:

All categories are established for classification of products. Products may not be available in all categories. Please contact your local Avago representatives for further clarification/information.

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, trichloro-ethylene, 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 further information on soldering LEDs, please refer to Application Note 1027.

For product information and a complete list of distributors, please go to our web site: www.avagotech.com

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AV02-2556EN - June 29, 2010

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