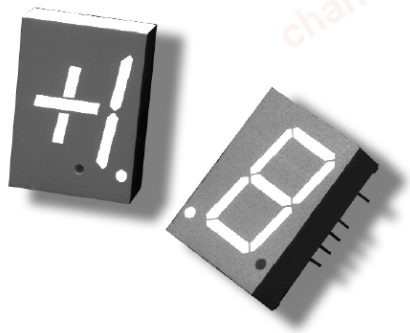
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HDSP-390x Series, HDSP-420x Series
HDSP-860x Series, HDSP-N15x Series

20 mm (0.8 inch) Seven Segment Displays

Data Sheet



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.

Applications

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.

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
  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
- 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

Devices

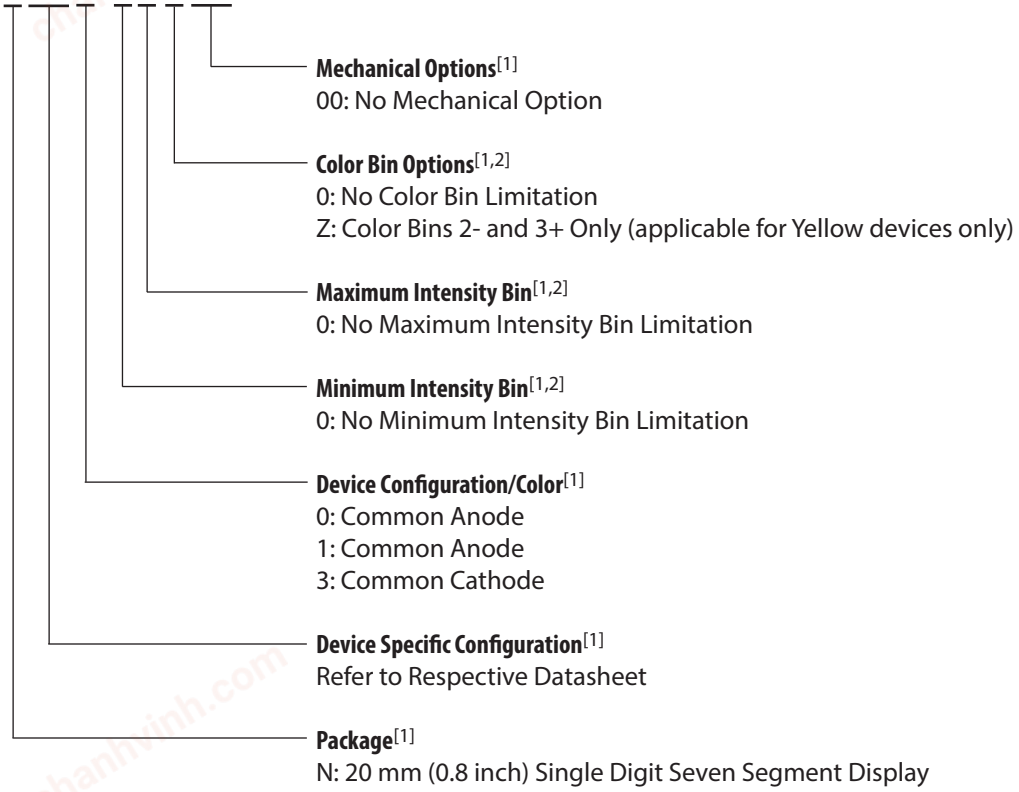
AlGaAs[1]	HER	Yellow	Green	Description	Package Drawing
HDSP-N150	HDSP-3900			Common Anode Left Hand Decimal	A
HDSP-N151	HDSP-3901	HDSP-4201	HDSP-8601	Common Anode Right Hand Decimal	B
HDSP-N153	HDSP-3903	HDSP-4203	HDSP-8603	Common Cathode Right Hand Decimal	C
	HDSP-3905			Common Cathode Left Hand Decimal	D

Notes:
1. These displays are recommended for high ambient light operation. Please refer to the HDSP-N10x AlGaAs data sheet for low current operation.

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Part Numbering System

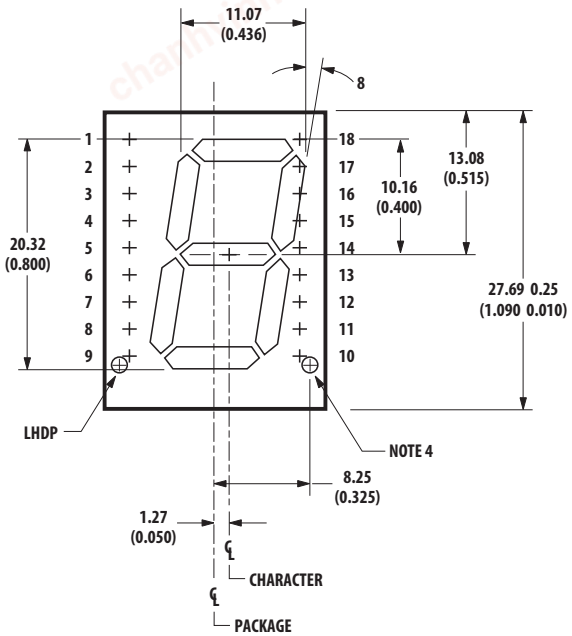
5082 - X X X X - X X X X X
HDSP- X X X X - X X X X X



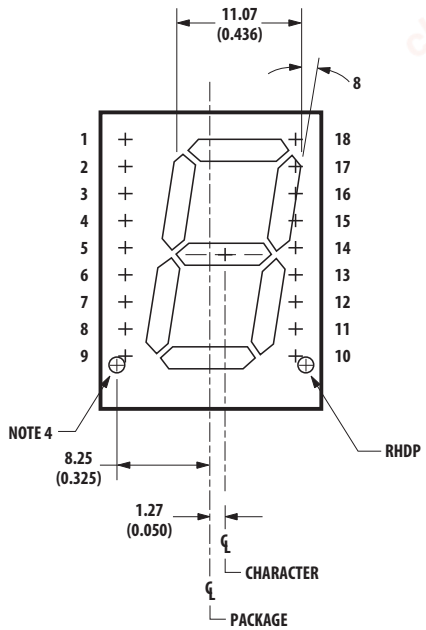
Notes:
1. For codes not listed in the figure above, please refer to the respective datasheet or contact your nearest Avago representative for details.
2. Bin options refer to shippable bins for a part number. Color and Intensity Bins are typically restricted to 1 bin per tube (exceptions may apply).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

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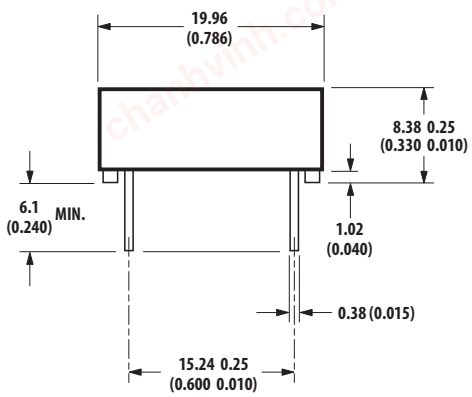
Package Dimensions



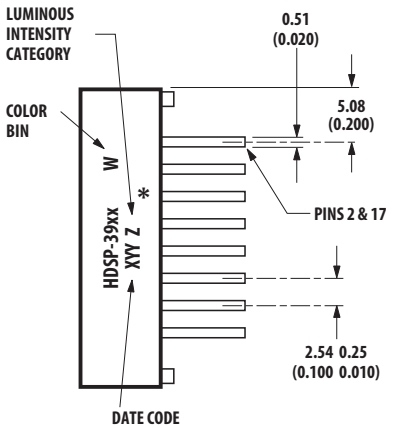
FRONT VIEW A, D



FRONT VIEW B, C



END VIEW



SIDE VIEW

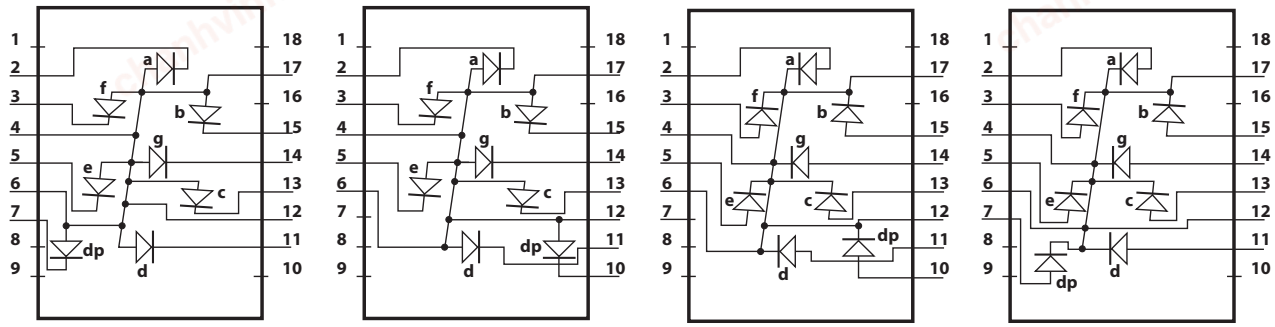
	FUNCTION			
PIN	A	B	C	D
1	NO PIN	NO PIN	NO PIN	NO PIN
2	CATHODE a	CATHODE a	ANODE a	ANODE a
3	CATHODE f	CATHODE f	ANODE f	ANODE f
4	ANODE [3]	ANODE [3]	CATHODE [6]	CATHODE [6]
5	CATHODE e	CATHODE e	ANODE e	ANODE e
6	ANODE [3]	ANODE [3]	CATHODE [6]	CATHODE [6]
7	CATHODE dp	NO CONNEC.	NO CONNEC.	ANODE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

* THE SIDE VIEW OF PACKAGE INDICATES COUNTRY OF ORIGIN.

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-420x/-860x SERIES PRODUCT ONLY.

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Internal Circuit Diagram



Absolute Maximum Ratings

Description	AlGaAs Red HDSP-N150 Series	HER HDSP-3900 Series	Yellow HDSP-420x Series	Green HDSP-860x Series	Units
Average Power per Segment or DP	96	105	105	105	mW
Peak Forward Current per Segment or DP	160[1]	135[3]	135[3]	90[5]	mA
DC Forward Current per Segment or DP	40[2]	40[4]	40[4]	30[6]	mA
Operating Temperature Range	–20 to +100 [7]	–40 to +100		–40 to +100	°C
Storage Temperature Range		–55 to +100			°C
Reverse Voltage* per Segment or DP		3.0			V
Wave Soldering Temperature for 3 Seconds (1.60 mm [0.063 in.]		250			°C

* reverse voltage is for LED testing purposes and is not recommended to be used as an application condition.

Notes:
1. See Figure 2 to establish pulsed conditions.
2. Derate above 55°C at 0.8 mA/°C.
3. See Figure 7 to establish pulsed conditions.
4. Derate above 50°C at 0.73 mA/°C.
5. See Figure 8 to establish pulsed conditions.
6. Derate above 50°C at 0.54 mA/°C.
7. For operation below –20°C, contact your local Avago components sales office or an authorized distributor.

Electrical/Optical Characteristics at $T_A = 25°C$

AlGaAs Red

Device Series - HDSP-N15x

Parameter	Symbol	Min.	Typ.	Max.	Units	Test Conditions
Luminous Intensity/Segment[1,2,5] (Digit Average)	I_V	6.0	14.0		mcd	I_F = 20 mA
Forward Voltage/Segment or DP	V_F		1.8		V	I_F = 20 mA
			2.0	3.0	V	I_F = 100 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 µA
Temperature Coefficient of V_F/Segment or DP	ΔV_F/°C		-2		mV/°C	
Thermal Resistance LED Junction-to-Pin	$R\theta_{J\text{-}PIN}$		430		°C/W/Seg	

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High Efficiency Red

Device Series - HDSP-390x

Parameter	Symbol	Min.	Typ.	Max.	Units	Test Conditions
Luminous Intensity/Segment [1,2] (Digit Average)	I_V	3350	7000		µcd	I_F = 100 mA Peak: 1 of 5 df
			4800		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}		635		nm	
Dominant Wavelength[3]	λ_d		626		nm	
Reverse Voltage/Segment or DP[4]	V_R	3.0	25		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	$R\theta_{J\text{-}PIN}$		375		°C/W/Seg	

Yellow

Device Series - HDSP-420x

Parameter	Symbol	Min.	Typ.	Max.	Units	Test Conditions
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 ofV_F/Segment or DP	ΔV_F/°C		-2		mV/°C	
Thermal Resistance LED Junction-to-Pin	$R\theta_{J\text{-}PIN}$		375		°C/W/Seg	

Green

Device Series - HDSP-860x

Parameter	Symbol	Min.	Typ.	Max.	Units	Test Conditions
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	$R\theta_{J\text{-}PIN}$		375		°C/W/Seg	

Notes:
1. Case temperature of the device immediately prior to the intensity measurement is 25°C.
2. The digits are categorized for luminous intensity. The intensity category is designated by a letter on the side of the package.
3. The dominant wavelength, ld, is derived from the CIE chromaticity diagram and is that single wavelength which defines the color of the device.
4. Typical specification for reference only. Do not exceed absolute maximum ratings.
5. 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.
6. The Yellow (HDSP-420x) and Green (HDSP-860x) displays are categorized for dominant wavelength. The category is designated by a number adjacent to the luminous intensity category letter.

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AlGaAs Red

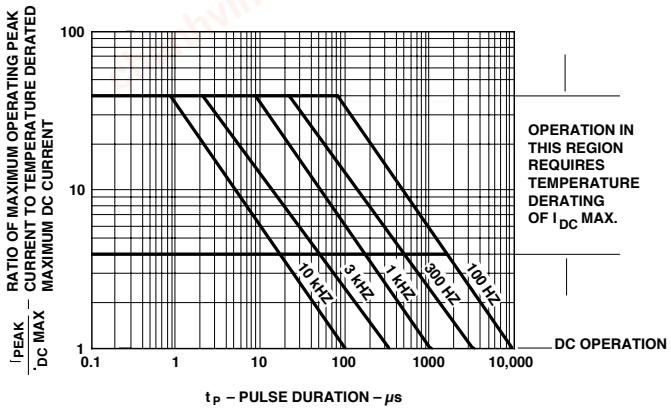


Figure 1. Maximum allowed peak current vs. pulse duration – AlGaAs Red.

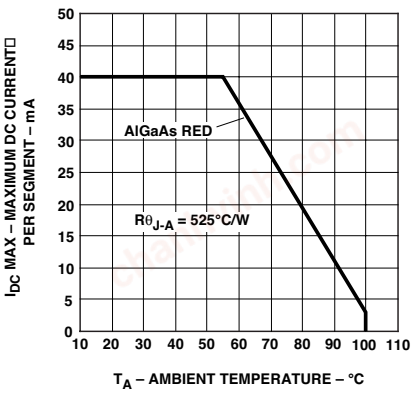


Figure 2. Maximum allowable DC current vs. ambient temperature.

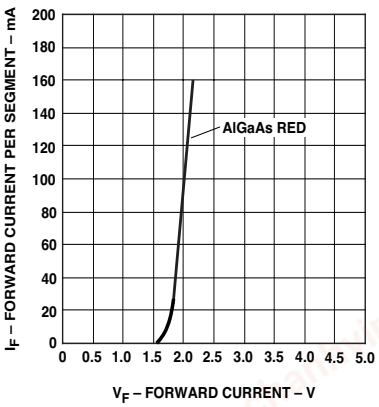


Figure 3. Forward current vs. forward voltage.

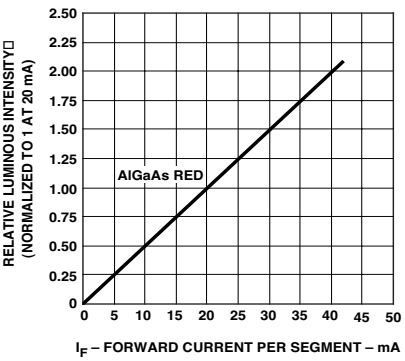


Figure 5.

Figure 4. Relative luminous intensity vs. DC forward current.

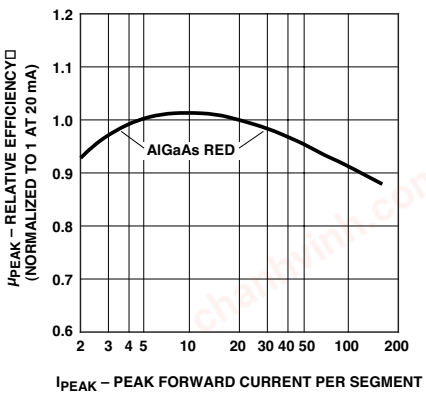


Figure 5. Relative efficiency (luminous intensity per unit current) vs. peak current.

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HER, Yellow, Green

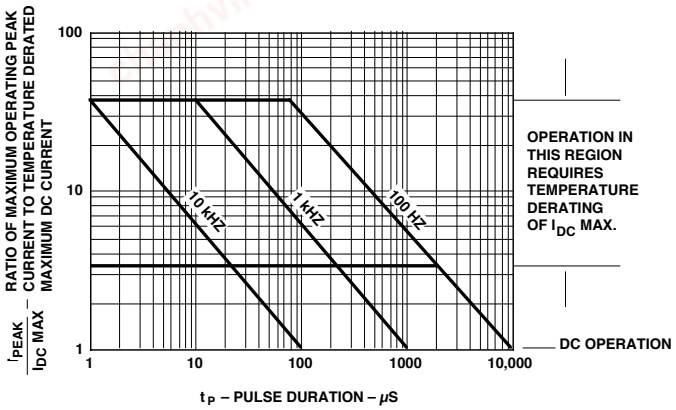


Figure 6. Maximum allowed peak current vs. pulse duration – HER, Yellow.

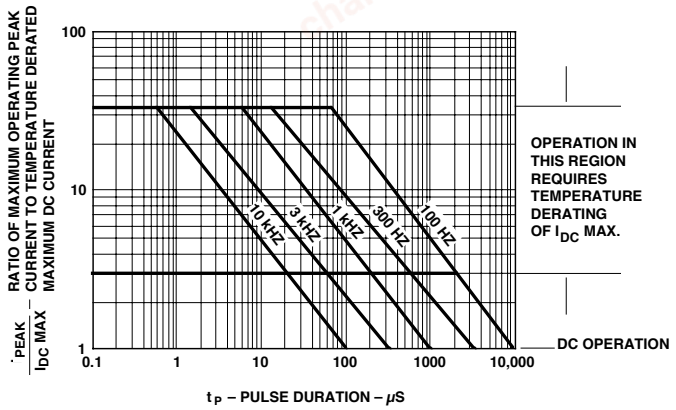


Figure 7. Maximum allowed peak current vs. pulse duration – Green.

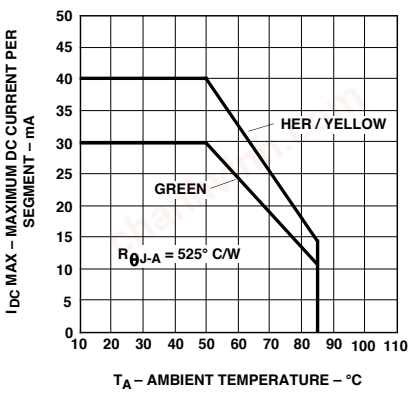


Figure 8. Maximum allowable DC current vs. ambient temperature.

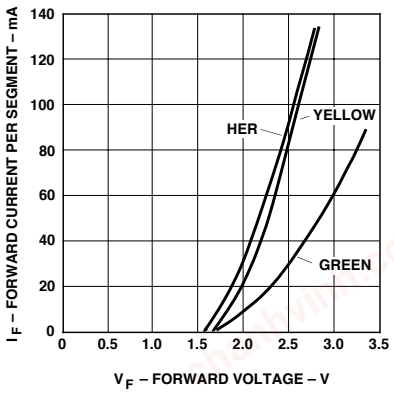


Figure 9. Forward current vs. forward voltage.

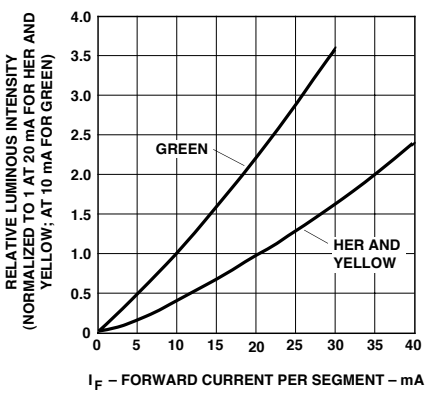


Figure 10. Relative luminous intensity vs. DC forward current.

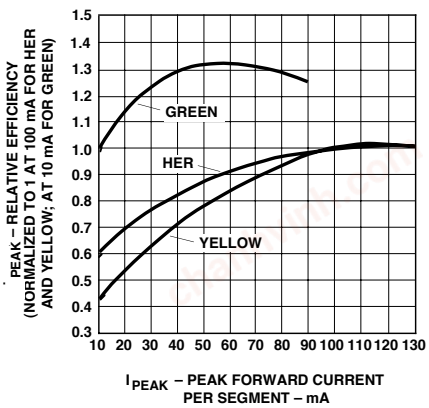


Figure 11. Relative efficiency (luminous intensity per unit current) vs. peak current.

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Intensity Bin Limits (mcd)

AlGaAs Red - HDSP-N15x

IV Bin Category	Min.	Max.
J	6.14	11.20
K	9.20	16.90
L	13.80	25.30
M	20.70	38.00
N	31.10	56.90
O	46.60	85.40

Yellow - HDSP-420x

IV Bin Category	Min.	Max.
C	2.23	4.09
D	3.35	6.14
E	5.02	9.21
F	7.53	13.82
G	11.30	20.72
H	16.95	31.08
I	25.43	46.62

Green - HDSP-860x

IV Bin Category	Min.	Max.
D	1.03	1.88
E	1.54	2.82
F	2.31	4.25
G	3.47	6.37
H	5.21	9.55

HER - HDSP-390x

IV Bin Category	Min.	Max.
D	3.35	6.14
E	5.02	9.21
F	7.53	13.82
G	11.30	20.72
H	16.95	31.08
I	25.43	46.62

Color Categories

		Dominant Wavelength (nm)	
Color	Bin	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 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 information on soldering LEDs, please refer to Application Note 1027.

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

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AV02-2551EN - October 9, 2015