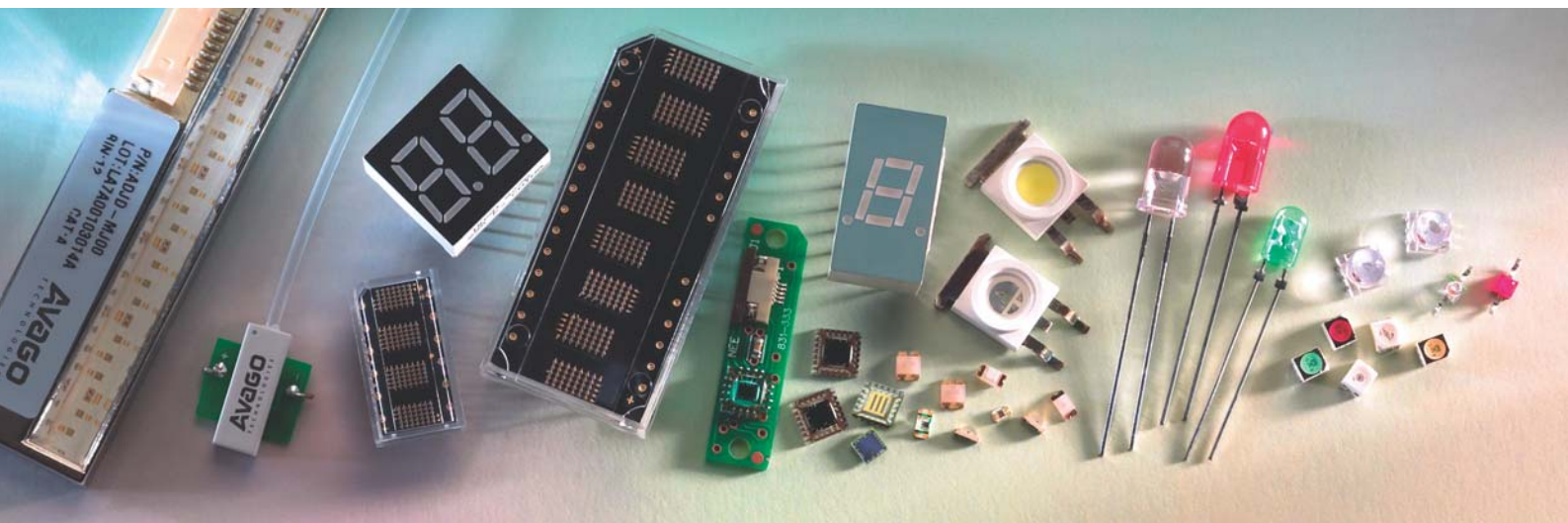


## LEDs, Color Management and Color Sensing Solutions



### Selection Guide

#### LED Solutions

- High Brightness LEDs
- LED Indicators and Displays

#### Color Management Solutions

#### Color Sensing Solutions

## LED Solutions

### High Brightness LEDs

- 2 – High Brightness Through-hole Lamps
- 18 – High Power LEDs
- 19 – High Power RGB LED Modules
- 22 – Surface Mount PLCC LEDs
- 29 – Envisium Surface Mount Power PLCC-4 LEDs

### LED Indicators and Displays

- 31 – Surface Mount ChipLEDs
- 40 – Auto Focus Auxiliary Flash LEDs
- 42 – Flexible Light Strip Modules
- 44 – Standard Through-hole Lamps
- 49 – Subminiature Lamps
- 53 – Seven-Segment Displays
- 77 – Light Bars and Bar Graph Arrays
- 81 – Smart Displays

### Color Management Solutions

- 91 – Color Sensing Solutions



## LED Solutions

Avago Technologies is one of the largest producers of visible light-emitting diodes in the world.

Avago Technologies offers “one-stop shopping” with its wide array of LEDs (Light Emitting Diodes), Color Management and Color Sensing Solutions. With our large manufacturing base and many years of experience from our HP and Agilent days, we are one of the largest producers of visible LEDs in the world and ships billions of products annually.

Avago employs the latest in material and process technology to produce superior LEDs. Our highly acclaimed AlInGaP (aluminium indium gallium phosphide) LED material offers high brightness and stable light output over thousands of hours with excellent mean-time-before-failure (MTBF). With our cutting edge LED technology, our solution also offers dazzling blue and green colors with InGaN (indium gallium nitride) material, and very cost-effective GaP (gallium phosphide) based technology, perfect for low to moderate light output. Avago’s LEDs create brilliant lights with rich life-like colors for our customers’ applications which are longer lasting and at a globally competitive price. They are suitable for almost any applications that customers need today with wide selection of viewing and package options.

Key products include from high brightness and high power LEDs, PLCC surface-mount LEDs, color sensors, display backlighting module solutions, to standard through-hole lamps, surface-mount LEDs, flash LEDs, flexible light strip modules, and various LED displays. These LEDs, Color Management and Color Sensing Solutions, address a wide range of markets, including electronic sign and signal, automotive, solid-state lighting, LCD display backlighting, consumer electronics, home and mobile appliances.

For virtually all established and emerging applications, Avago Technologies has the right LEDs, Color Management and Color Sensing Solutions to meet your design requirements.





## High Brightness Through-hole Lamps

### Description

Avago Technologies offers two types of technology-based LEDs. AllInGaP and InGaN product offering are suitable for high brightness needs. Through-hole LEDs are offered in a variety of packages such as 3 mm, 4 mm and 5 mm.

These devices are casted from advanced optical grade epoxy, which provides superior high temperature performance and excellent moisture resistance.

Through-hole LEDs are suitable for all applications requiring backlighting and status indication. Manufacturers of signs and message panels as well as consumer electronics and automotive interiors use LEDs to add value to their products. Low power consumption, high reliability and a broad range of colors and packages are just a few reasons why.

### Features and Benefits

- Excellent product quality and reliability
- Wide range of products
- Competitive pricing
- Wide operating temperature range
  - With minor electrical/optical changes
- Lower power consumption
  - High efficiency, low drive currents and low driving voltages required
- High reliability
  - No replacement for life of equipment
- High reliability for AllInGaP lamps compared to TS AlGaAs at equivalent pricing and high brightness
  - No replacement for life of equipment with 100 or 1000 hours projected life
- Thin, light weight and robust packaging
  - Excellent performance even under vibration and mechanical shock
- Four colors available with high luminous intensity in AllInGaP LED lamps
  - Amber (590 nm), Red (626 nm), Orange (605 nm) and Red-Orange (615 nm)
- Four colors available with high luminous intensity in InGaN LED lamps
  - Blue (470 nm), Green (527 nm), Cyan (505 nm) and White
- Several packaging options
  - Different sizes with a clear or diffused lens and different spatial radiation patterns available in bulk and ammo-pack

### Typical Applications

All applications requiring back lighting and status indications in:

- Electronic Signs and Signals
  - road safety signs
  - exit signs
  - moving message panels
  - static message displays
  - full color signs
  - traffic signals
- Consumer
  - gaming and vending machines
- Automotive and Other
  - automotive interior
  - exercise equipment
  - medical equipment
  - front panel industrial equipment

# LED Solutions

## High Brightness Lamps

Part Number	Color	Dominant Wavelength (nm)	Intensity (mcd) @ 20 mA		Leads with Stand-offs
			Min.	Max.	
Precision Optical Performance AlInGaP 5 mm Round LED Lamps					
<b>8° Viewing Angle</b>					
<b>HLMP-EG08-T0000</b>	<b>Red</b>	<b>626</b>	<b>2500</b>	–	<b>No</b>
<b>HLMP-EG08-WZ000</b>	<b>Red</b>	<b>626</b>	<b>5500</b>	<b>16000</b>	<b>No</b>
HLMP-EG08-X1000	Red	626	7200	21000	No
HLMP-EG10-T0000	Red	626	2500	–	Yes
HLMP-EG10-WZ000	Red	626	5500	16000	Yes
HLMP-EG10-X1000	Red	626	7200	21000	Yes
<b>HLMP-EH08-X1000</b>	<b>Red-Orange</b>	<b>615</b>	<b>7200</b>	<b>21000</b>	<b>No</b>
<b>HLMP-EJ08-X1000</b>	<b>Orange</b>	<b>605</b>	<b>7200</b>	<b>21000</b>	<b>No</b>
HLMP-EJ10-X1000	Orange	605	7200	21000	Yes
<b>HLMP-EL08-T0000</b>	<b>Amber</b>	<b>590</b>	<b>2500</b>	–	<b>No</b>
<b>HLMP-EL08-VY000</b>	<b>Amber</b>	<b>590</b>	<b>4200</b>	<b>12000</b>	<b>No</b>
HLMP-EL08-WZ000	Amber	590	5500	16000	No
HLMP-EL10-T0000	Amber	590	2500	–	Yes
HLMP-EL10-VY000	Amber	590	4200	12000	Yes

Part numbers in BOLD are recommended for new designs.

# LED Solutions

## High Brightness Lamps

Part Number	Color	Dominant Wavelength (nm)	Intensity (mcd) @ 20 mA		Leads with Stand-offs
			Min.	Max.	
Precision Optical Performance AlInGaP 5 mm Round LED Lamps					
<b>15° Viewing Angle</b>					
HLMP-EG15-N0000	Red	626	680	–	No
HLMP-EG15-QT000	Red	626	1150	3200	No
HLMP-EG15-RU000	Red	626	1500	4200	No
HLMP-EG15-TW000	Red	626	2500	7200	No
HLMP-EG15-UX000	Red	626	3200	9300	No
HLMP-EG17-N0000	Red	626	680	–	Yes
HLMP-EG17-QT000	Red	626	1150	3200	Yes
HLMP-EG17-TW000	Red	626	2500	7200	Yes
HLMP-EG17-UX000	Red	626	3200	9300	Yes
HLMP-EH15-RU000	Red-Orange	615	1500	4200	No
HLMP-EH15-TW000	Red-Orange	615	2500	7200	No
HLMP-EH15-UX000	Red-Orange	615	3200	9300	No
HLMP-EH17-TW000	Red-Orange	615	2500	7200	Yes
HLMP-EH17-UX000	Red-Orange	615	3200	9300	Yes
HLMP-EJ15-QT000	Orange	605	1150	3200	No
HLMP-EJ17-QT000	Orange	605	1150	3200	Yes
HLMP-EL15-PS000	Amber	590	880	2500	No
HLMP-EL15-QSK00*	Amber	590	1150	2500	No
HLMP-EL15-QT000	Amber	590	1150	3200	No
HLMP-EL15-TW000	Amber	590	2500	7200	No
HLMP-EL15-TWK00	Amber	590	2500	7200	No
HLMP-EL15-UX000	Amber	590	3200	9300	No
HLMP-EL15-VY000	Amber	590	4200	12000	No
HLMP-EL15-VYK00	Amber	590	4200	12000	No
HLMP-EL17-M0000	Amber	590	520	–	Yes
HLMP-EL17-TW000	Amber	590	2500	7200	Yes
HLMP-EL17-UX000	Amber	590	3200	9300	Yes
HLMP-EL17-VY000	Amber	590	4200	12000	Yes

\* HLMP-xLxx-xxK00 are selected to Amber color bins 2 and 4 only.

# LED Solutions

## High Brightness Lamps

Part Number	Color	Dominant Wavelength (nm)	Intensity (mcd) @ 20 mA		Leads with Stand-offs
			Min.	Max.	
Precision Optical Performance AlInGaP 5 mm Round LED Lamps					
<b>23° Viewing Angle</b>					
HLMP-EG24-M0000	Red	626	520	–	No
HLMP-EG24-PS000	Red	626	880	2500	No
HLMP-EG24-QT000	Red	626	1150	3200	No
HLMP-EG26-M0000	Red	626	520	–	Yes
HLMP-EH24-QT000	Red-Orange	615	1150	3200	No
HLMP-EH24-SV000	Red-Orange	615	1900	5500	No
HLMP-EH26-SV000	Red-Orange	615	1900	5500	Yes
HLMP-EJ24-QT000	Orange	605	1150	3200	No
HLMP-EL24-L0000	Amber	590	400	–	No
HLMP-EL24-NR000	Amber	590	680	1900	No
HLMP-EL24-PS000	Amber	590	880	2500	No
HLMP-EL24-RU000	Amber	590	1150	4200	No
HLMP-EL24-RUK00	Amber	590	1150	4200	No
HLMP-EL24-SV000	Amber	590	1900	5500	No
HLMP-EL24-SVK00	Amber	590	1900	5500	No
HLMP-EL24-TW000	Amber	590	2500	7200	No
HLMP-EL24-TWK00	Amber	590	2500	7200	No
HLMP-EL26-L0000	Amber	590	400	–	Yes
HLMP-EL26-PS000	Amber	590	880	2500	Yes
HLMP-EL26-RU000	Amber	590	1150	4200	Yes
HLMP-EL26-SV000	Amber	590	1900	5500	Yes
HLMP-EL26-TW000	Amber	590	2500	7200	Yes

Part numbers in BOLD are recommended for new designs.

# LED Solutions

## High Brightness Lamps

Part Number	Color	Dominant Wavelength (nm)	Intensity (mcd) @ 20 mA		Leads with Stand-offs
			Min.	Max.	
<b>Precision Optical Performance AlInGaP 5 mm Round LED Lamps</b>					
<b>30° Viewing Angle</b>					
HLMP-EG30-K0000	Red	626	310	–	No
HLMP-EG30-MQ000	Red	626	520	1500	No
HLMP-EG30-NR000	Red	626	680	1900	No
HLMP-EG30-QT000	Red	626	1150	3200	No
HLMP-EG32-K0000	Red	626	310	–	Yes
HLMP-EG32-MQ000	Red	626	520	1500	Yes
HLMP-EG32-NR000	Red	626	680	1900	Yes
HLMP-EG32-QT000	Red	626	1150	3200	Yes
HLMP-EH30-QT000	Red-Orange	615	1150	3200	No
HLMP-EH30-RU000	Red-Orange	615	1500	4200	No
HLMP-EH32-QT000	Red-Orange	615	1150	3200	Yes
HLMP-EH32-RU000	Red-Orange	615	1500	4200	Yes
HLMP-EJ30-NR000	Orange	605	680	1900	No
HLMP-EL30-K0000	Amber	590	310	–	No
HLMP-EL30-MQ000	Amber	590	520	1500	No
HLMP-EL30-QT000	Amber	590	1150	3200	No
HLMP-EL30-QTK00	Amber	590	1150	3200	No
HLMP-EL30-SV000	Amber	590	1900	5500	No
HLMP-EL30-SVK00	Amber	590	1900	5500	No
HLMP-EL32-K0000	Amber	590	310	–	Yes
HLMP-EL32-NR000	Amber	590	680	1900	Yes
HLMP-EL32-QT000	Amber	590	1150	3200	Yes
HLMP-EL32-SV000	Amber	590	1900	5500	Yes
<b>Extra High Brightness Lamps</b>					
<b>5mm 15° Viewing Angle</b>					
HLMP-EG12-UX0DD	Red	626	3200	9300	No
HLMP-EG13-UX0DD	Red	626	3200	9300	Yes
HLMP-EH12-VY0DD	Red-Orange	615	4200	12000	No
HLMP-EH13-VY0DD	Red-Orange	615	4200	12000	Yes
HLMP-EL12-VY0DD	Amber	590	4200	12000	No
HLMP-EL13-VY0DD	Amber	590	4200	12000	Yes
<b>5mm 23° Viewing Angle</b>					
HLMP-EG22-VY0DD	Red	626	4200	12000	No
HLMP-EG23-VY0DD	Red	626	4200	12000	Yes
HLMP-EH22-TW0DD	Red-Orange	615	2500	7200	No
HLMP-EH23-TW0DD	Red-Orange	615	2500	7200	Yes
HLMP-EL22-UX0DD	Amber	590	3200	9300	No
HLMP-EL23-UX0DD	Amber	590	3200	9300	Yes
<b>5mm 30° Viewing Angle</b>					
HLMP-EG35-TW0DD	Red	626	2500	7200	No
HLMP-EG37-TW0DD	Red	626	2500	7200	Yes
HLMP-EH35-SV0DD	Red-Orange	615	1900	5500	No
HLMP-EH37-SV0DD	Red-Orange	615	1900	5500	Yes
HLMP-EL35-TW0DD	Amber	590	2500	7200	No
HLMP-EL37-TW0DD	Amber	590	2500	7200	Yes



# LED Solutions

## High Brightness Lamps

Part Number	Color	Dominant Wavelength (nm)	Intensity (mcd) @ 20 mA		Leads with Stand-offs
			Min.	Max.	
Precision Optical Performance AlInGaP II 5 mm Round LED Lamps					
<b>15° Viewing Angle</b>					
HLMP-ED16-S0000	Red	630	1900	–	No
HLMP-ED16-TW000	Red	630	2500	7200	No
HLMP-ED18-S0000	Red	630	1900	–	Yes
HLMP-ED18-TW000	Red	630	2500	7200	No
HLMP-EH16-UX000	Red-Orange	615	3200	9300	No
HLMP-EH18-UX000	Red-Orange	615	3200	9300	Yes
HLMP-EL16-S0000	Amber	592	1900	–	No
HLMP-EL16-VY000	Amber	592	4200	12000	No
HLMP-EL18-S0000	Amber	592	1900	–	Yes
HLMP-EL18-VY000	Amber	592	4200	12000	Yes
<b>23° Viewing Angle</b>					
HLMP-ED25-R0000	Red	630	1500	–	No
HLMP-ED25-SV000	Red	630	1900	5500	No
HLMP-ED25-TW000	Red	630	2500	7200	No
HLMP-ED27-R0000	Red	630	1500	–	Yes
HLMP-ED27-SV000	Red	630	1900	5500	Yes
HLMP-ED27-TW000	Red	630	2500	7200	Yes
HLMP-EH25-SV000	Red-Orange	615	1900	5500	No
HLMP-EH25-TW000	Red-Orange	615	2500	7200	No
HLMP-EL25-Q0000	Amber	592	1150	–	No
HLMP-EL25-SUK00	Amber	592	1900	4200	No
HLMP-EL25-SV000	Amber	592	1900	5500	No
HLMP-EL25-SVK00	Amber	592	1900	5500	No
HLMP-EL25-TW000	Amber	592	2500	5500	No
HLMP-EL27-Q0000	Amber	592	1150	–	Yes
HLMP-EL27-SV000	Amber	592	1900	5500	Yes
HLMP-EL27-TW000	Amber	592	2500	7200	Yes
<b>30° Viewing Angle</b>					
HLMP-ED31-Q0000	Red	630	1150	–	No
HLMP-ED31-SV000	Red	630	1900	5500	No
HLMP-ED33-Q0000	Red	630	1150	–	Yes
HLMP-ED33-SV000	Red	630	1900	5500	Yes
HLMP-EH31-SV000	Red-Orange	615	1900	5500	No
HLMP-EH33-RU000	Red-Orange	615	1500	4200	Yes
HLMP-EL31-P0000	Amber	592	880	–	No
HLMP-EL31-SV000	Amber	592	1900	5500	No
HLMP-EL31-SVK00*	Amber	592	1900	5500	No
HLMP-EL33-P0000	Amber	592	880	–	Yes
HLMP-EL33-SV000	Amber	592	1900	5500	Yes

\* HLMP-xLxx-xxK00 are selected to Amber color bins 2 and 4 only.

# LED Solutions

## High Brightness Lamps

Part Number	Color	Dominant Wavelength (nm)	Intensity (mcd) @ 20 mA		Leads with Stand-offs
			Min.	Max.	
Precision Optical Performance AlInGaP II 5 mm Round LED Lamps					
<b>55° Viewing Angle</b>					
HLMP-ED57-LP000	Red	630	400	1150	No
HLMP-EH57-LP000	Red-Orange	615	400	1150	No
HLMP-EL57-LP000	Amber	592	400	1150	No

Precision Optical Performance 4 mm Round LED Lamps					
<b>30° Viewing angle</b>					
HLMP-YL35-RURDD	Amber	592	1500	4200	Yes
HLMP-YD35-QTTDD	Red	630	1150	3200	Yes
HLMP-YM35-VY0DD	Green	525	4200	12000	Yes
HLMP-YB35-RU0DD	Blue	470	1500	4200	Yes

Precision Optical Performance InGaN 5 mm LED Lamps					
<b>15° Viewing Angle</b>					
HLMP-CB11-TW0xx	Blue	470	2500	7200	No
HLMP-CB12-TW0xx	Blue	470	2500	7200	Yes
<b>HLMP-CB15-P0000</b>	<b>Blue</b>	<b>472</b>	<b>880</b>	–	<b>No</b>
HLMP-CB15-QT000	Blue	472	1150	3200	No
HLMP-CB15-R0000	Blue	472	1500	–	No
HLMP-CB15-RSC00	Blue	472	1500	2500	No
HLMP-CB16-QT000	Blue	472	1150	3200	Yes
HLMP-CE11-X10xx	Cyan	505	7200	21000	No
HLMP-CE12-X10xx	Cyan	505	7200	21000	Yes
HLMP-CE16-UXQ00	Cyan	505	3200	9300	Yes
HLMP-CM11-Y20xx	Green	525	9300	27000	No
HLMP-CM11-Z1Cxx	Green	525	12000	21000	No
HLMP-CM12-Y20xx	Green	525	9300	27000	Yes
<b>HLMP-CM15-S0000</b>	<b>Green</b>	<b>526</b>	<b>1900</b>	–	<b>No</b>
HLMP-CM15-VY000	Green	526	4200	12000	No
HLMP-CM15-W0000	Green	526	5500	–	No
HLMP-CM15-WXB00	Green	526	5500	9300	No
HLMP-CM16-VY000	Green	526	4200	12000	Yes
<b>23° Viewing Angle</b>					
HLMP-CB26-SV0xx	Blue	470	1900	5500	No
HLMP-CB26-TUDxx	Blue	470	2500	4200	No
HLMP-CB27-SV0xx	Blue	470	1900	5500	Yes
HLMP-CE26-WZ0xx	Cyan	505	5500	16000	No
HLMP-CE27-WZ0xx	Cyan	505	5500	16000	Yes
HLMP-CM26-X10xx	Green	525	7200	21000	No
HLMP-CM26-YZCxx	Green	525	9300	16000	No
HLMP-CM27-X10xx	Green	525	7200	21000	Yes

# LED Solutions

## High Brightness Lamps

Part Number	Color	Dominant Wavelength (nm)	Intensity (mcd) @ 20 mA		Leads with Stand-offs
			Min.	Max.	
<b>30° Viewing Angle</b>					
<b>HLMP-CB30-K0000</b>	<b>Blue</b>	<b>472</b>	<b>310</b>	–	<b>No</b>
HLMP-CB30-M0000	Blue	472	520	–	No
HLMP-CB30-NRG00	Blue	472	680	1900	No
HLMP-CB30-PQCDD	Blue	472	880	1500	No
HLMP-CB31-NRG00	Blue	472	680	1900	Yes
<b>HLMP-CB36-QT0xx</b>	<b>Blue</b>	<b>470</b>	<b>1500</b>	<b>4200</b>	<b>No</b>
<b>HLMP-CB36-RSBxx</b>	<b>Blue</b>	<b>470</b>	<b>1500</b>	<b>2500</b>	<b>No</b>
<b>HLMP-CB37-RSDxx</b>	<b>Blue</b>	<b>470</b>	<b>1500</b>	<b>2500</b>	<b>Yes</b>
<b>HLMP-CB37-RU0xx</b>	<b>Blue</b>	<b>470</b>	<b>1500</b>	<b>4200</b>	<b>Yes</b>
HLMP-CE30-RSC00	Cyan	505	1500	2500	No
HLMP-CE36-WZ0xx	Cyan	505	5500	16000	No
HLMP-CE37-WZ0xx	Cyan	505	5500	16000	Yes
<b>HLMP-CM30-M0000</b>	<b>Green</b>	<b>526</b>	<b>520</b>	–	<b>No</b>
HLMP-CM30-RSB00	Green	526	1500	2500	No
HLMP-CM30-S0000	Green	526	1900	–	No
HLMP-CM30-TUB00	Green	526	2500	4200	No
HLMP-CM30-TUCDD	Green	526	2500	4200	No
HLMP-CM30-TW000	Green	526	2500	7200	No
HLMP-CM30-TWA00	Green	526	2500	7200	No
HLMP-CM30-UVA00	Green	526	3200	5500	No
HLMP-CM31-TUCDD	Green	526	2500	4200	Yes
HLMP-CM31-TW000	Green	526	2500	7200	Yes
HLMP-CM31-TWA00	Green	526	2500	7200	Yes
<b>HLMP-CM36-X10xx</b>	<b>Green</b>	<b>525</b>	<b>7200</b>	<b>21000</b>	<b>No</b>
<b>HLMP-CM36-XYCxx</b>	<b>Green</b>	<b>525</b>	<b>7200</b>	<b>12000</b>	<b>No</b>
<b>HLMP-CM37-X10xx</b>	<b>Green</b>	<b>525</b>	<b>7200</b>	<b>21000</b>	<b>Yes</b>
<b>HLMP-CM37-XYCxx</b>	<b>Green</b>	<b>525</b>	<b>7200</b>	<b>12000</b>	<b>Yes</b>
HLMP-CM37-XYDxx	Green	525	7200	12000	Yes

Part numbers in BOLD are recommended for new designs.

# LED Solutions

## High Brightness Lamps

Part Number	Color	Typical X, Y Coordinate	Intensity (cd) @ 20 mA		Viewing Angle (Degree)	Leads with Stand-offs
			Min.	Max.		
<b>T1 3/4 InGaN White LED Lamps</b>						
HLMP-CW11-X10xx	White	0.31,0.31	7.2	21.0	15	No
HLMP-CW12-X10xx	White	0.31,0.31	7.2	21.0	15	Yes
HLMP-CW15-TW000	White	0.32,0.32	2.50	7.20	15	No
HLMP-CW15-TW0DD	White	0.32,0.32	2.50	7.20	15	No
HLMP-CW15-VY000	White	0.32,0.32	4.20	12.00	15	No
HLMP-CW15-VY0DD	White	0.32,0.32	4.20	12.00	15	No
HLMP-CW16-VY000	White	0.32,0.32	4.20	12.00	15	Yes
HLMP-CW16-VY0DD	White	0.32,0.32	4.20	12.00	15	Yes
HLMP-CW23-SV000	White	0.32,0.32	1.90	5.50	23	No
HLMP-CW23-SV0DD	White	0.32,0.32	1.90	5.50	23	No
HLMP-CW23-TW000	White	0.32,0.32	2.50	7.20	23	No
HLMP-CW23-TW0DD	White	0.32,0.32	2.50	7.20	23	No
HLMP-CW24-TW000	White	0.32,0.32	2.50	7.20	23	Yes
HLMP-CW24-TW0DD	White	0.32,0.32	2.50	7.20	23	Yes
HLMP-CW26-VY0xx	White	0.31,0.31	4.2	12.0	23	No
HLMP-CW27-VY0xx	White	0.31,0.31	4.2	12.0	23	Yes
HLMP-CW30-PS000	White	0.32,0.32	0.88	2.50	30	No
HLMP-CW30-PS0DD	White	0.32,0.32	0.88	2.50	30	No
HLMP-CW30-SV000	White	0.32,0.32	1.90	5.50	30	No
HLMP-CW30-SV0DD	White	0.32,0.32	1.90	5.50	30	No
HLMP-CW31-PS000	White	0.32,0.32	0.88	2.50	30	Yes
HLMP-CW31-SV000	White	0.32,0.32	1.90	5.50	30	Yes
HLMP-CW31-SV0DD	White	0.32,0.32	1.90	5.50	30	Yes
HLMP-CW36-UX0xx	White	0.31,0.31	3.2	9.3	30	No
HLMP-CW37-UX0xx	White	0.31,0.31	3.2	9.3	30	Yes
HLMP-CW46-RU0xx	White	0.31,0.31	1.5	4.2	50	No
HLMP-CW47-RU0xx	White	0.31,0.31	1.5	4.2	50	Yes
HLMP-CW70-LP000	White	0.32,0.32	0.40	1.15	70	No
HLMP-CW70-LP0DD	White	0.32,0.32	0.40	1.15	70	No
HLMP-CW72-LP000	White	0.32,0.32	0.40	1.15	70	Yes
HLMP-CW72-LP0DD	White	0.32,0.32	0.40	1.15	70	Yes
HLMP-CW76-QT0xx	White	0.31,0.31	1.15	3.2	70	No
HLMP-CW77-QT0xx	White	0.31,0.31	1.15	3.2	70	Yes
<b>Flat Top InGaN White LED Lamp</b>						
HLMP-FW00-JM000	White	0.32,0.32	0.24	0.68	90	No
HLMP-FW66-MQ0xx	White	0.31,0.31	0.52	1.5	90	No
HLMP-FW67-MQ0xx	White	0.31,0.31	0.52	1.5	90	Yes

# LED Solutions

## High Brightness Lamps

Part Number	Package Drawing	Color	Dominant Wavelength (nm)	Intensity (mcd) @ 20 mA		Leads with Stand-offs	Tint	Leadframe Orientation
				Min.	Max.			
Precision Optical Performance AlInGaP 4 mm Oval LED Lamps								
<b>60° x 120° Viewing Angle</b>								
HLMP-RG10-JM000	F	Red	626	240	680	Yes	Red	Parallel
HLMP-RL10-LP000	F	Amber	590	400	1150	Yes	Amber	Parallel
HLMP-SG10-JM000	E	Red	626	240	680	Yes	Red	Perpendicular
HLMP-SL10-LP000	E	Amber	590	400	1150	Yes	Amber	Perpendicular
Precision Optical Performance AlInGaP II 4 mm Oval LED Lamps								
<b>50° x 100° Viewing Angle</b>								
HLMP-LD63-SWTZZ	A	Red	630	660	1660	Yes	Red	
<b>60° x 120° Viewing Angle</b>								
<b>HLMP-RD11-J0000</b>	<b>F</b>	<b>Red</b>	<b>630</b>	<b>240</b>	<b>–</b>	<b>Yes</b>	<b>Amber</b>	<b>Parallel</b>
<b>HLMP-RD11-LP000</b>	<b>F</b>	<b>Red</b>	<b>630</b>	<b>400</b>	<b>1150</b>	<b>Yes</b>	<b>Red</b>	<b>Parallel</b>
HLMP-RL11-H0000	F	Amber	592	180	–	Yes	Amber	Parallel
HLMP-RL11-LP000	F	Amber	592	400	1150	Yes	Amber	Parallel
HLMP-SD11-J0000	E	Red	630	240	–	Yes	Red	Perpendicular
HLMP-SD11-LP000	E	Red	630	400	1150	Yes	Red	Perpendicular
<b>HLMP-SL11-H0000</b>	<b>E</b>	<b>Amber</b>	<b>592</b>	<b>180</b>	<b>–</b>	<b>Yes</b>	<b>Amber</b>	<b>Perpendicular</b>
<b>HLMP-SL11-LP000</b>	<b>E</b>	<b>Amber</b>	<b>592</b>	<b>400</b>	<b>1150</b>	<b>Yes</b>	<b>Amber</b>	<b>Perpendicular</b>






Part Number	Package Drawing	Color	Dominant Wavelength (nm)	Intensity (mcd) @ 20 mA		Leads with Stand-offs
				Min.	Max.	
Precision Optical Performance InGaN 4 mm Oval LED Lamps						
<b>50° x 100° Viewing Angle</b>						
HLMP-LB11-FJ000	D	Blue	472	110	310	Yes
HLMP-LB11-HJCDD	D	Blue	472	180	310	Yes
HLMP-LB11-HL000	D	Blue	472	180	520	Yes
HLMP-LB11-JKCDD	D	Blue	472	240	400	Yes
HLMP-LM11-LP000	D	Green	526	400	1150	Yes
HLMP-LM11-MNCDD	D	Green	526	520	880	Yes
HLMP-LM11-NR000	D	Green	526	680	1900	Yes
HLMP-LM11-PQCDD	D	Green	526	880	1500	Yes
HLMP-LM11-QRCDD	D	Green	526	1150	1900	Yes
HLMP-LM63-X20ZZ	A	Green	525	1660	4200	Yes
HLMP-LB63-PT0ZZ	A	Blue	470	380	960	Yes












Part Number	Package Drawing	Color	Dominant Wavelength (nm)	Intensity (mcd) @ 20 mA		Leads with Stand-offs	Tint	Leadframe Orientation
				Min.	Max.			
Precision Optical Performance InGaN 4 mm Oval LED Lamps								
<b>60° x 120° Viewing Angle</b>								
<b>HLMP-RB11-D0000</b>	<b>F</b>	<b>Blue</b>	<b>472</b>	<b>65</b>	<b>–</b>	<b>Yes</b>	<b>Blue</b>	<b>Parallel</b>
<b>HLMP-RM11-H0000</b>	<b>F</b>	<b>Green</b>	<b>526</b>	<b>180</b>	<b>–</b>	<b>Yes</b>	<b>Green</b>	<b>Parallel</b>
HLMP-SB11-H00xx	E	Blue	472	180	–	Yes	Blue	Perpendicular
HLMP-SM11-LP0xx	E	Green	526	400	1150	Yes	Green	Perpendicular









Part numbers in BOLD are recommended for new designs.

# LED Solutions

## High Brightness Lamps

Part Number	Package Drawing	Color	Dominant Wavelength (nm)	Intensity (mcd) @ 20 mA		Leads with Stand-offs	Tint	Leadframe Orientation
				Min.	Max.			
<b>Precision Optical Performance AlInGaP 5 mm Oval LED Lamps</b>								
<b>30° x 70° Viewing Angle</b>								
HLMP-AL61-X1TZZ	1	 Red	630	1660	3500	Yes	Red	
<b>35° x 70° Viewing Angle</b>								
HLMP-AL01-NR000	W	 Amber	590	680	1900	No	Amber	Parallel
HLMP-AL11-NR000	X	 Amber	590	680	1900	Yes	Amber	Parallel
HLMP-BL01-NR000	Y	 Amber	590	680	1900	No	Amber	Perpendicular
HLMP-BL11-NR000	Z	 Amber	590	680	1900	Yes	Amber	Perpendicular

<b>Precision Optical Performance AlInGaP II 5 mm Oval LED Lamps</b>								
<b>35° x 70° Viewing Angle</b>								
HLMP-AD06-P0000	W	 Red	630	880	–	No	Red	Parallel
HLMP-AD16-P0000	X	 Red	630	880	–	Yes	Red	Parallel
HLMP-AL06-N0000	W	 Amber	592	680	–	No	Amber	Parallel
HLMP-AL16-N0000	X	 Amber	592	680	–	Yes	Amber	Parallel
HLMP-BD06-P0000	Y	 Red	630	880	–	No	Red	Perpendicular
HLMP-BD16-P0000	Z	 Red	630	880	–	Yes	Red	Perpendicular
HLMP-BL06-N0000	Y	 Amber	592	680	–	No	Amber	Perpendicular
HLMP-BL16-N0000	Z	 Amber	592	680	–	Yes	Amber	Perpendicular
<b>40° x 100° Viewing Angle</b>								
HLMP-HD61-TXTZZ	G	 Red	630	800	1990	Yes	Red	
<b>Precision Optical Performance InGaN 5 mm Oval LED Lamps</b>								
<b>30° x 70° Viewing Angle</b>								
HLMP-AB61-RU0ZZ	1	 Blue	470	550	1150	Yes	Blue	
HLMP-AM61-Z30ZZ	1	 Green	525	2400	5040	Yes	Green	

Part Number	Package Drawing	Color	Dominant Wavelength (nm)	Intensity (cd) @ 20 mA		Leads with Stand-offs
				Min.	Max.	
<b>Precision Optical Performance InGaN 5 mm Oval LED Lamps</b>						
<b>40° x 100° Viewing Angle</b>						
HLMP-HB55-FJ000	G	 Blue	472	110	310	Yes
HLMP-HB55-HJCDD	G	 Blue	472	180	310	Yes
HLMP-HB55-JKCDD	G	 Blue	472	240	400	Yes
HLMP-HM55-MQ000	G	 Green	526	520	1500	Yes
HLMP-HM55-NPCDD	G	 Green	526	680	1150	Yes
HLMP-HM55-PQCDD	G	 Green	526	880	1500	Yes
HLMP-HM61-Y30ZZ	G	 Green	525	1990	5040	Yes
HLMP-HB61-QU0ZZ	G	 Blue	470	460	1150	Yes

# LED Solutions

## High Brightness Lamps

Part Number	Package Drawing	Color	Dominant Wavelength (nm)	Intensity (mcd) @ 70 mA		Leads with Stand-offs
				Min.	Max.	
<b>5 mm Standard Oval Mid Power AllnGaP LEDs</b>						
<b>40° x 100° Viewing Angle</b>						
HLMP-HD30-SV000	A	Red	626	1900	5500	No
HLMP-HD31-SV000	B	Red	626	1900	5500	Yes
HLMP-HL30-RU000	A	Amber	592	1500	4200	No
HLMP-HL31-RU000	B	Amber	592	1500	4200	Yes
<b>5 mm Mini Oval Mid Power AllnGaP LEDs</b>						
<b>30° x 70° Viewing Angle</b>						
HLMP-AD30-UX000	A	Red	626	3200	9300	No
HLMP-AD31-UX000	B	Red	626	3200	9300	Yes
HLMP-AL30-TW000	A	Amber	592	2500	7200	No
HLMP-AL31-TW000	B	Amber	592	2500	7200	Yes

### High Brightness LED Lamps 1.3:1 Intensity Bin Limits (mcd at 20mA)

Bin Name	Min.	Max.
D	65	85
E	85	110
F	110	140
G	140	180
H	180	240
J	240	310
K	310	400
L	400	520
M	520	680
N	680	880
P	880	1150
Q	1150	1500
R	1500	1900
S	1900	2500
T	2500	3200
U	3200	4200
V	4200	5500
W	5500	7200
X	7200	9300
Y	9300	12000
Z	12000	16000
1	16000	21000

Tolerance for each bin limit is ±15%

### High Brightness LED Lamps 1.2:1 Intensity Bin Limits (mcd at 20mA)

Bin Name	Min.	Max.
P	380	460
Q	460	550
R	550	660
S	660	800
T	800	960
U	960	1150
V	1150	1380
W	1380	1660
X	1660	1990
Y	1990	2400
Z	2400	2900
1	2900	3500
2	3500	4200
3	4200	5040

### White Color Bin Limit Tables

Rank	Limits (Chromaticity Coordinates)				
	x	y	z	x	y
1	x	0.330	0.330	0.356	0.361
	y	0.360	0.318	0.351	0.385
2	x	0.287	0.296	0.330	0.330
	y	0.295	0.276	0.318	0.339
3	x	0.264	0.280	0.296	0.283
	y	0.267	0.248	0.276	0.305
4	x	0.283	0.287	0.330	0.330
	y	0.305	0.295	0.339	0.360

Tolerance for each bin limit is ±0.01

### Color Bin Structure

Bin ID	nm @ 20 mA	
	Min.	Max.
1	460	464
2	464	468
3	468	472
4	472	476
5	476	480

Tolerance for each bin limit is ± 0.5 nm

Green	Min.	Max.
1	520	524
2	524	528
3	528	532
4	532	536
5	536	540

Tolerance for each bin limit is ± 0.5 nm

Amber	Min.	Max.
1	584.5	587.0
2	587.0	589.5
4	589.5	592.0
6	592.0	594.5

Tolerance for each bin limit is ± 0.5 nm

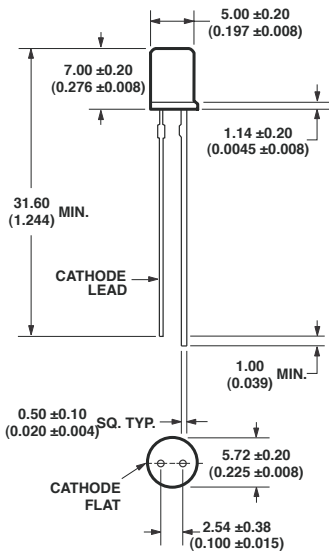
Cyan	Min.	Max.
1	490	495
2	495	500
3	500	505
4	505	510
7	498	503
8	503	508

Tolerance for each bin limit is ± 0.5 nm

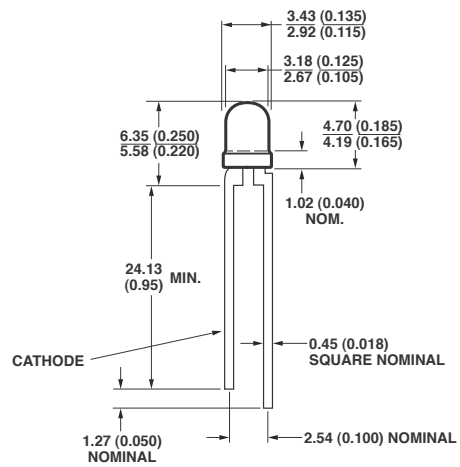
These intensity and color charts show the various binning information for Precision Optical Performance AllnGaP LEDs. Red and reddish orange devices are not color binned as eyes are less sensitive to wavelength shifts in these color regions.

# LED Solutions

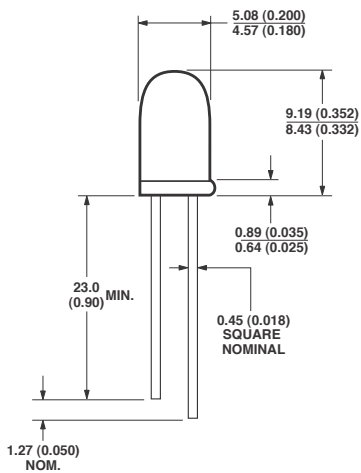
## 5 mm Flat Top LED Lamps Package



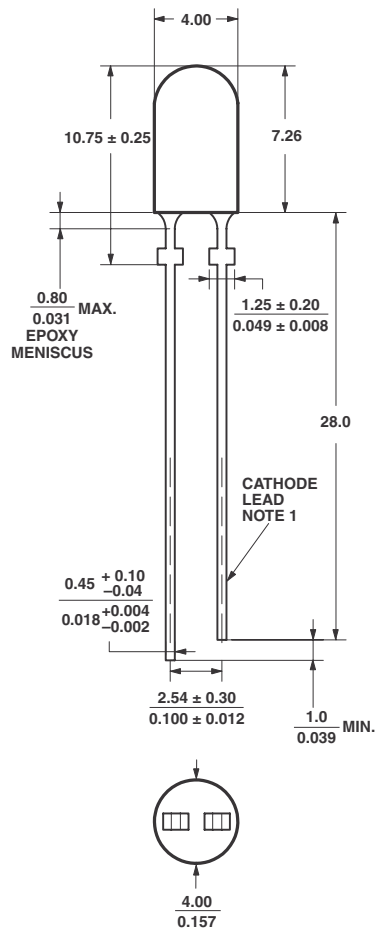
## 3 mm (T1) LED Lamps Package



## 5 mm (T1 3/4) LED Lamps Package



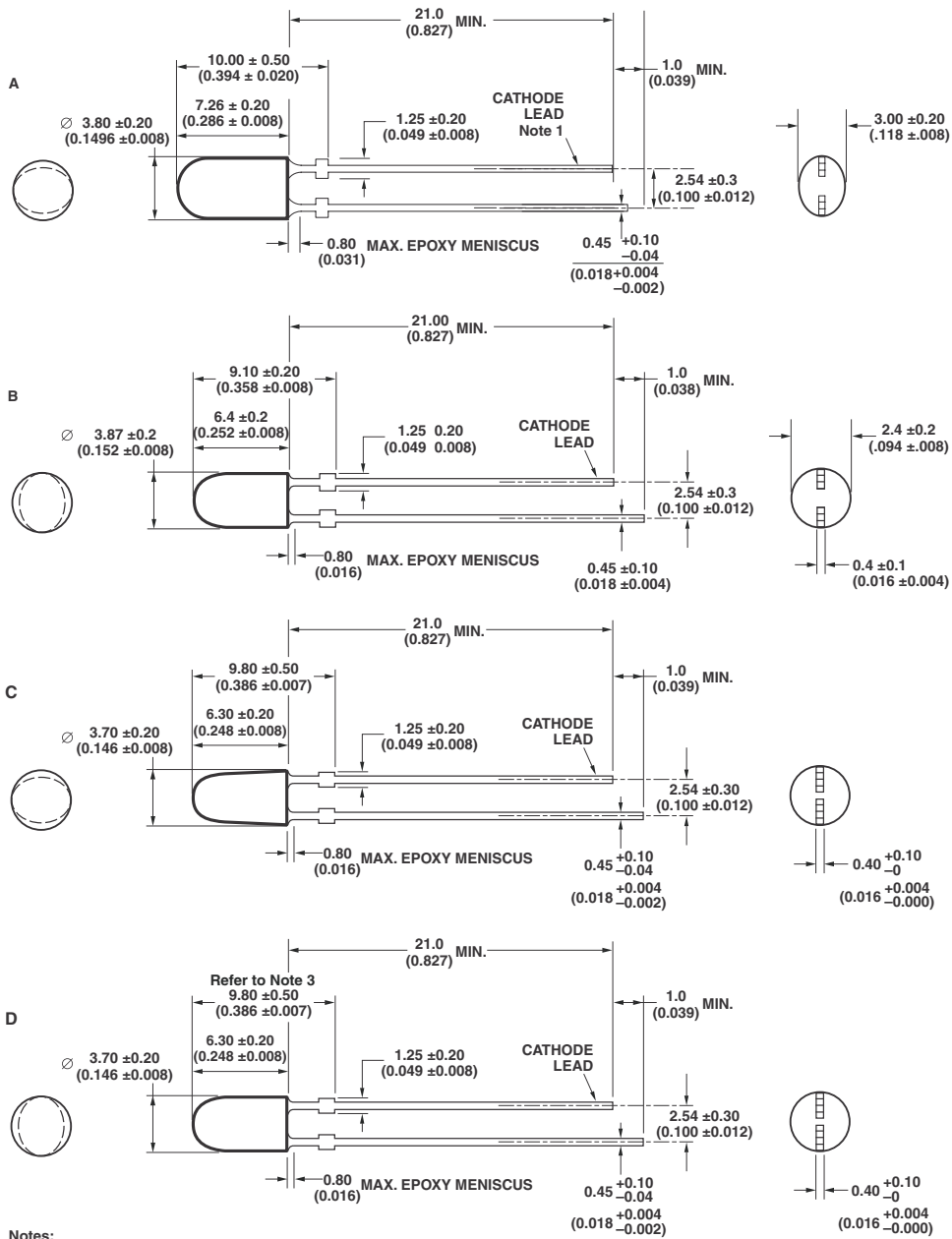
## 4 mm Round Lamp Package





# LED Solutions

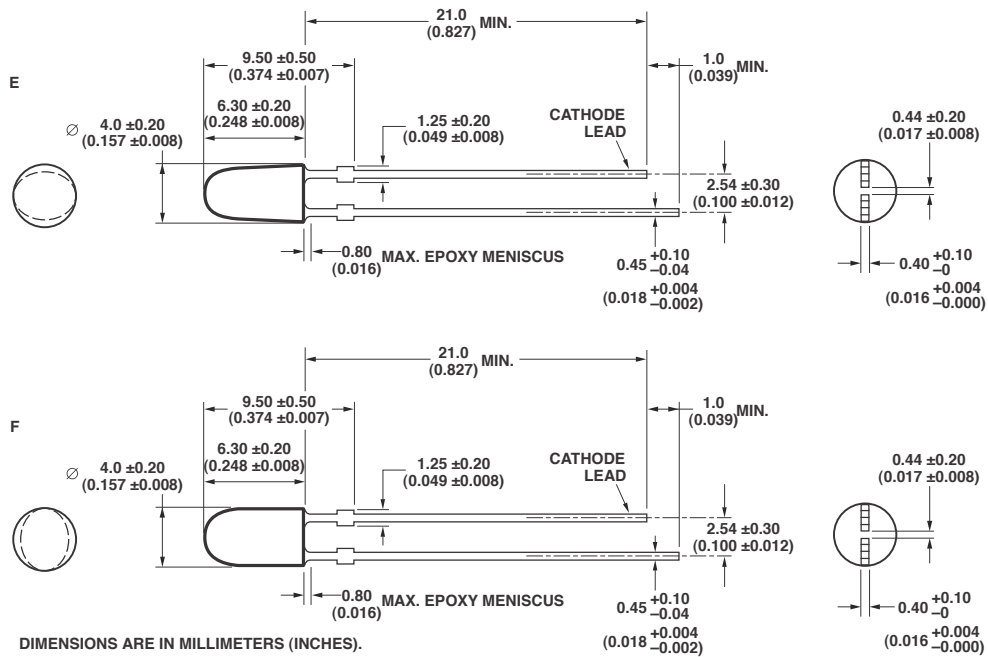
## 4 mm Oval LED Lamps 50° x 100° Viewing Angle



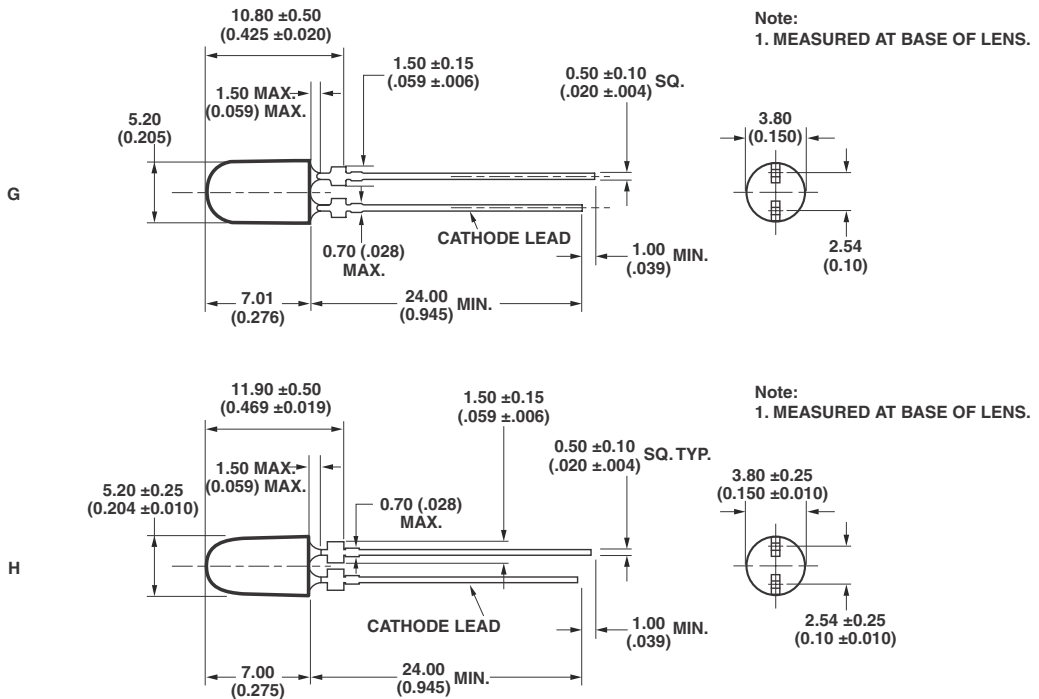
- Notes:
1. Dimensions in millimeters (inches).
  2. Tolerance is ±0.1 unless otherwise noted.
  3. For LB11 and LM11, the package height is 9.80 ± 0.18.

# LED Solutions

## 4 mm Oval LED Lamps 60° x 120° Viewing Angle

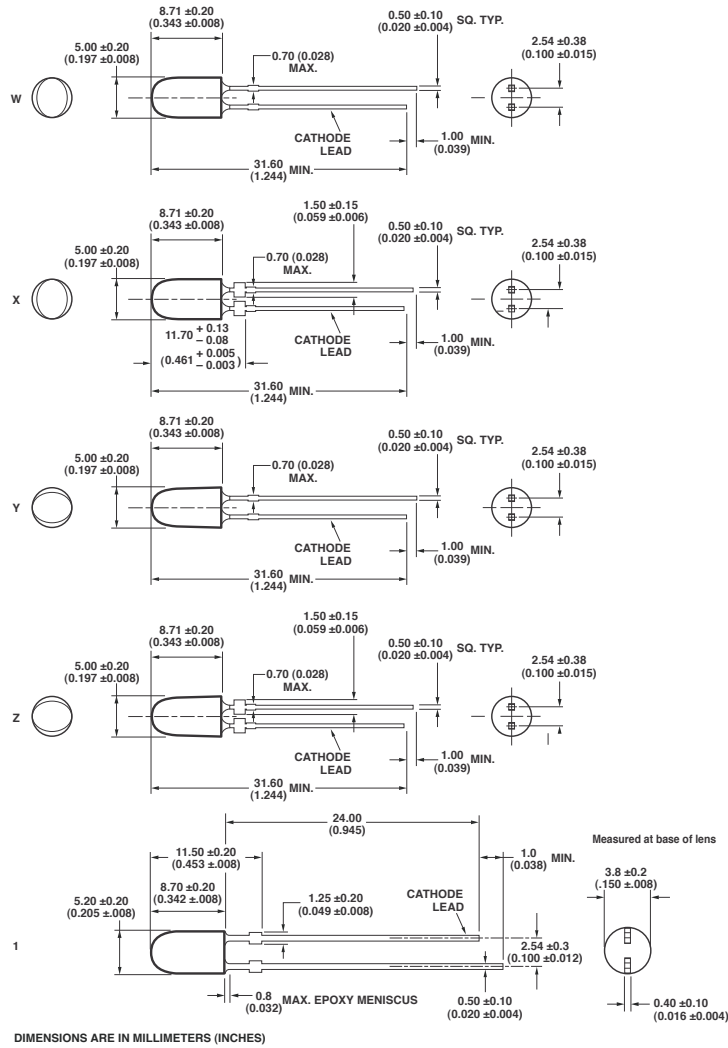


## 5 mm Oval LED Lamps 40° x 100° Viewing Angle

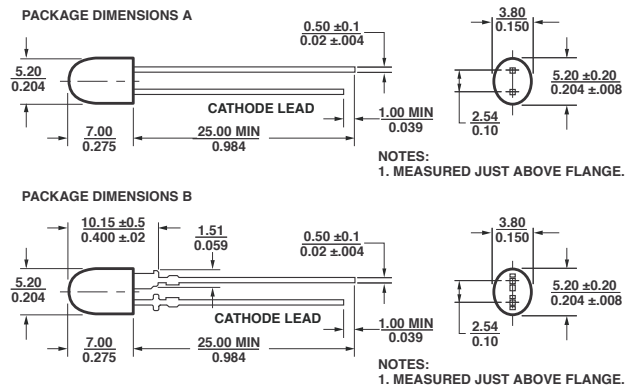


# LED Solutions

## 5mm Oval LED Lamps 35° x 70° Viewing Angle

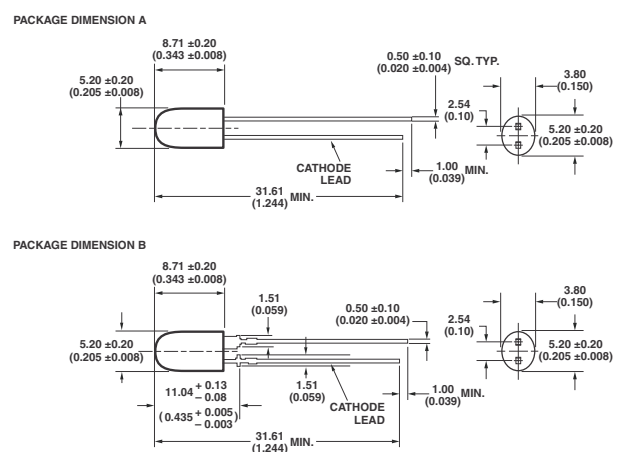


## 5 mm Standard Oval Mid Power AllnGaP LEDs 40° x 100° Viewing Angle



DIMENSIONS ARE IN MILLIMETERS (INCHES)

## 5 mm Mini Oval Mid Power AllnGaP LEDs 30° x 70° Viewing Angle





### High Power LEDs

#### Description

High Power LED is a high-performance, energy-efficient device that can handle high-thermal and high-driving current. The exposed pad design has excellent heat transfer from the package to the motherboard. The low-profile package design is suitable for a wide variety of applications, especially where height is a constraint. The package is compatible with the SMT reflow soldering process and manual soldering. This will give more freedom and flexibility to the light source designer.

#### Features and Benefits

- Available in White, Blue, Green color
- Energy efficient
- Exposed pad for excellent heat transfer
- Suitable for SMT process
- High-current operation
- Long operation life
- Wide viewing angle
- Silicone encapsulation

#### Typical Applications

- Portable (flashlight, bicycle headlight)
- Reading light
- Architectural lighting
- Garden lighting
- Decorative lighting

#### Specifications

- InGaN technology
- 3.6 V, 350 mA (typical)
- 120° viewing angle

# LED Solutions

## 1W High Power LEDs

Part Number	Color	Dominant Wavelength $\lambda_D$ (nm)	Viewing Angle $2\theta_{1/2}$ (°)	Luminous Flux, $\Phi_v$ (lm)			Forward Voltage $V_f$ (V)	Test Current (mA)	Dice Technology
				Min.	Typ.	Max.			
ASMT-MG00-NGJ00	Green	525	120	25.5	40	73.0	3.6	350	InGaN
ASMT-MB00-NAE00	Blue	467	120	5.5	10	19.5	3.6	350	InGaN

Part Number	Color	Typical Chromaticity Coordinates		Viewing Angle $2\theta_{1/2}$ (°)	Luminous Flux, $\Phi_v$ (lm)			Forward Voltage $V_f$ (V)	Test Current (mA)	Dice Technology
		x	y		Min.	Typ.	Max.			
ASMT-MW00-NHJZ0	White	0.33	0.33	110	33.0	45.0	56.0	3.6	350	InGaN

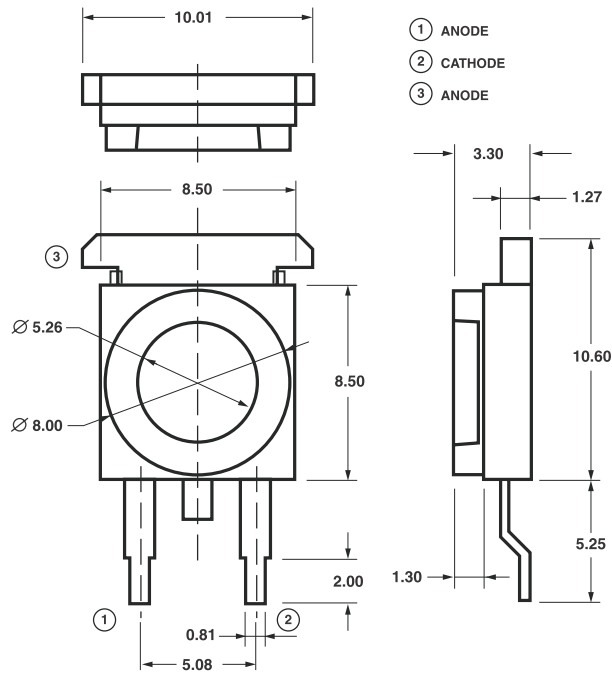
## 3W High Power LEDs

Part Number	Color	Typical Chromaticity Coordinates		Viewing Angle $2\theta_{1/2}$ (°)	Luminous Flux, $\Phi_v$ (lm)			Forward Voltage $V_f$ (V)	Test Current (mA)	Dice Technology
		x	y		Min.	Typ.	Max.			
ASMT-MW20-NLN00	White	0.33	0.33	110	73.0	140.0	161.0	4.0	700	InGaN

### Notes:

1. Typical values at  $T_j = 25^\circ\text{C}$ .
2. All values are typical values unless otherwise specified.
3.  $\Phi_v$  is the total luminous flux output as measured with an integrating sphere at mono pulse condition.
4. Flux tolerance is  $\pm 15\%$ .
5. The dominant wavelength,  $\lambda_D$ , is derived from the CIE Chromaticity Diagram and represents the color of the device.
6.  $\theta_{1/2}$  is the off-axis angle where the luminous intensity is  $1/2$  the peak intensity.

## High Power LEDs



### Notes:

1. All Dimensions in millimeters.
2. Tolerance is  $\pm 0.1$  mm unless otherwise specified.

# LED Solutions



## High Power RGB LED Modules

### Description

Avago Technologies' new High Power RGB LED Module is the industry's first Plug and Play RGB LED Light Source which can be operated at high driving current. The built-in heat sink and the mechanical mounting features simplify the thermal management of a lighting solution. This enables effective heat transfer and maintain LED junction below maximum allowed temperature.

The footprint of the top emitting package is 100mm x 18mm x 3.6mm with aperture of 96mm x 6mm. The footprint of side emitting package is 100mm x 18mm x 8mm with aperture of 96mm x 4.6mm. The reflector cavity design maximized the light extraction as well as maximized the color mixing to produce the required color. Together with closely pitched LED dice, the color mixing is best of its class.

### Features and Benefits

- High flux output
- Choice of top emitting or side emitting
- Compact footprint
- Integrated heatsink
- Red, Green & Blue color premix in the reflector cavity to produce required color
- Silicone encapsulation
- Plug and play mechanical mounting and electrical connection (connector interface)
- Ease of stacking horizontally and vertically
- Simplified thermal management
- Extra long product life
- Fully serviceable due to ease of mounting and demounting.

### Typical Applications

- Decorative lighting
- Architectural lighting
- Specialty lighting
- Backlighting
- Commercial lighting

## Product Specifications

Part Number	Orientation	Color	Wavelength (nm)	Material Type	Current (IF)	Voltage (V <sub>f</sub> )	Viewing Angle	Luminous Flux (lm)
-------------	-------------	-------	-----------------	---------------	--------------	---------------------------	---------------	--------------------

### ADJD-MJ50

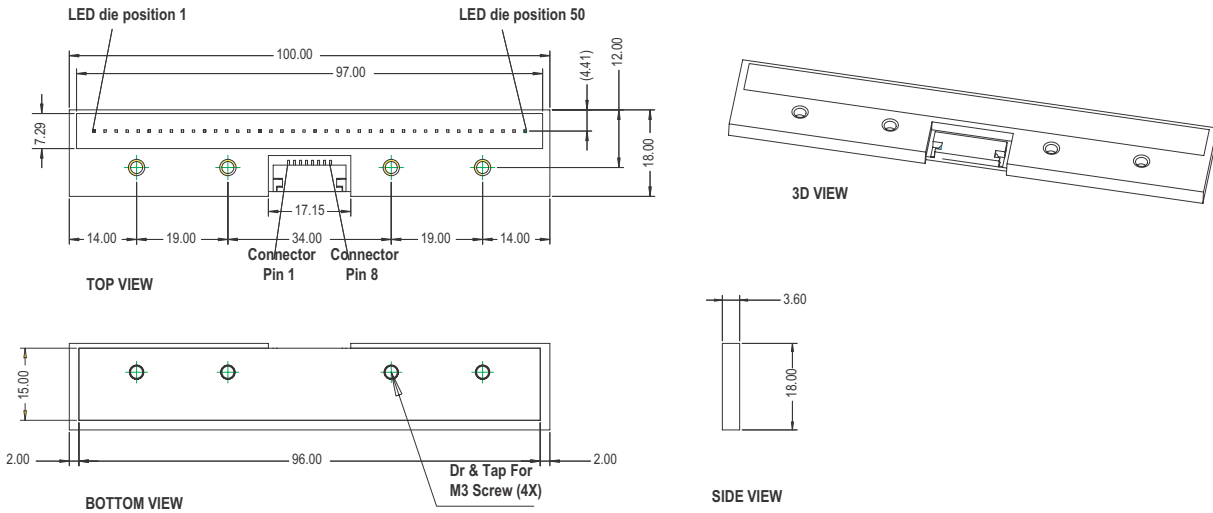
	Top Emitting	Red	617	AllnGaP	300	29	110	200
	Side Emitting	Green G1	530	InGaN	150	35	110	125
		Green G2	530	InGaN	150	35	110	125
		Blue	457	InGaN	150	35	110	30

### ADJD-MJ60

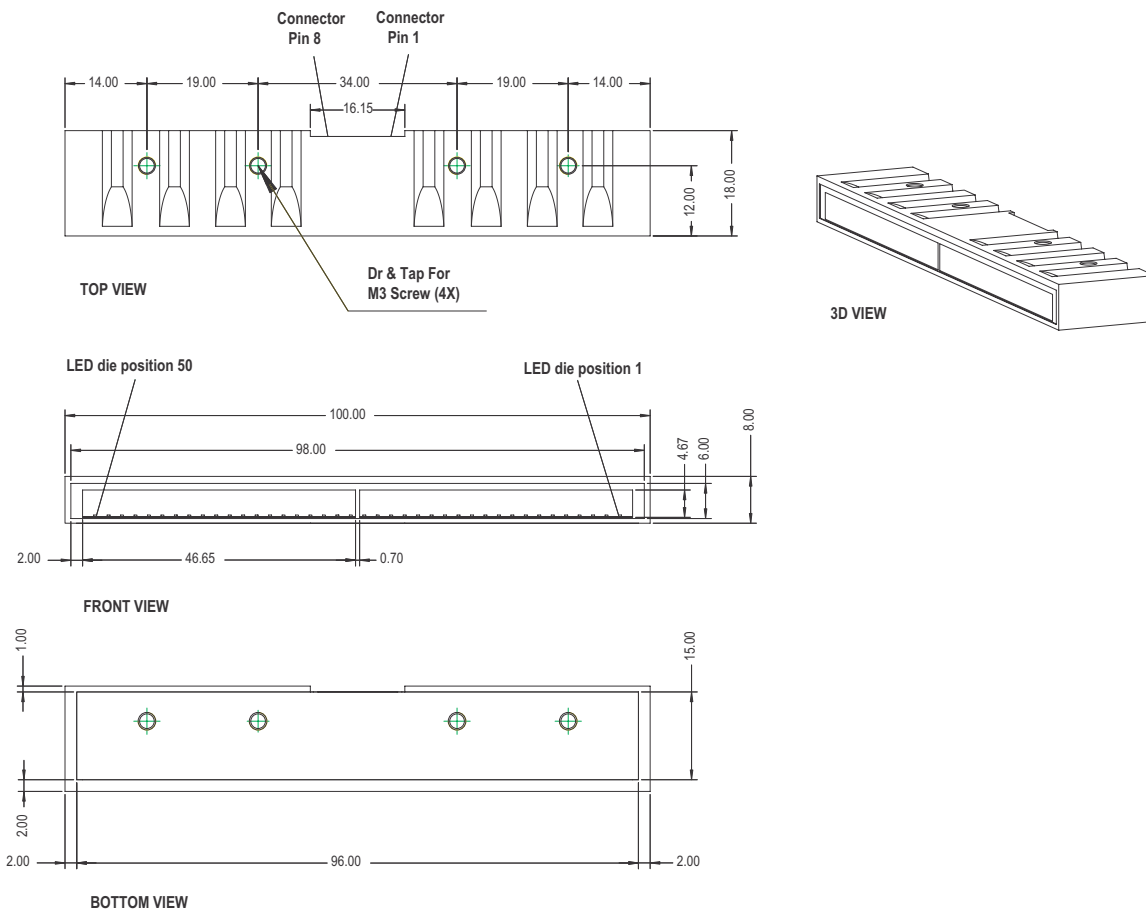
Part Number	Orientation	Color	Wavelength (nm)	Material Type	Current (IF)	Voltage (V <sub>f</sub> )	Viewing Angle	Luminous Flux (lm)
	Top Emitting	Red	617	AllnGaP	300	29	110	200
	Side Emitting	Green G1	530	InGaN	150	35	110	125
		Green G2	530	InGaN	150	35	110	125
		Blue	457	InGaN	150	35	110	30

# LED Solutions

## Package Dimensions ADJD-MJ50 (Top Emitting)



## ADJD-MJ60 (Side Emitting)



**Notes:**

1. All Dimensions are in millimeters.
2. Tolerance =  $\pm 0.20$  mm unless otherwise specified.

### Surface Mount PLCC LEDs



#### Description

This surface-mount LED comes in PLCC standard package dimension. It has a substrate made up of a molded plastic reflector sitting on top of a bent lead frame. The die is attached within the reflector cavity and the cavity is encapsulated by an Avago Technologies proprietary epoxy blend.

The PLCC SMT LED products with a viewing angle of 120° is ideal for instruments/switch/icon backlighting. With additional lens in 30° variants, these products are especially fitting to applications for traffic lights, CHMSL and displays. Its external reflector makes easy coupling with light pipe/light guide for an even-larger area backlighting. The package design coupled with careful selection of component materials allow these products to perform with high reliability in a larger temperature range -40°C to 100°C. The high reliability feature is crucial to Automotive Interior and Indoor ESS.

This package is also designed to be compatible with both IR-solder reflow and through-the-wave soldering.

#### Features and Benefits

- Industry Standard PLCC SMT package
  - No change in existing board layout, drop-in replacement for the existing PLCC SMT LEDs
- High brightness using AlInGaP and InGaN dice technologies
- Available in multiple colors
  - Broad range of colors: Red, Red-Orange, Orange, Amber, Yellow-Green, Emerald Green, Green, Cyan, Blue and White
- Available in viewing angle of 30° and 120°
  - Well-suited for backlighting applications
- High volume, high reliability
  - Cost-effective solution
- Compatible with both IR and TTW soldering process
- Black reflector surface option for reduce contrast in ESS
- High brightness performance – only PLCC SMT LED supplier offering TS AlInGaP material

#### Special Product Features/Benefits

- Mold Clamp
  - Provides highest reliability performance by eliminating leadframe-epoxy delamination after solder reflow
- Reflector Step Down
  - Perfect SMT pick-up due to epoxy overfill being eliminated
- Package Bottom Chamfer
  - Perfect lead forming giving high reliability performance (no lead over-formed), and no “tomb-stoning” defect after solder reflow

#### Target Markets and Applications

- Interior automotive
  - Instrument panel backlighting
  - Central console backlighting
  - Cabin backlighting
- Exterior automotive
  - Turn signals
  - Side repeater lamps
  - CHMSLs (center high-mounted stop light)
  - Rear combination lamps
  - Puddle lights
- Electronic Signs and Signals
  - Interior full color sign
  - Variable message sign
- Office Automation, Electrical Appliances, Industrial Equipment
  - Front panel backlighting
  - Push button backlighting
  - Display backlighting



# LED Solutions

## PLCC Surface Mount LEDs

### PLCC-2 Part Numbers and Typical Product Performance

Part Number	Color	Dominant Wavelength $\lambda_D$ (nm)	Viewing Angle $2\theta_{1/2}$ (°)	$I_v$ @ 20 mA		$V_f$ @ 20 mA Typ. (V)
				Min. (mcd)	Typ. (mcd)	
HSMS-A100-L00J1	GaP Red	626	120	10	15	2.2
HSMH-A100-N00J1	AlGaAs Red	637	120	25	50	1.9
HSMC-A100-Q00J1	AllnGaP Red	626	120	63	100	1.9
HSMC-A100-R00J1	AllnGaP Red	626	120	100	140	1.9
HSMC-A101-S00J1	AllnGaP Red	626	120	160	220	1.9
HSMZ-A100-T00J1	AllnGaP Red	630	120	250	350	2.2
HSMJ-A100-Q00J1	AllnGaP Red Orange	615	120	63	100	1.9
HSMJ-A101-S00J1	AllnGaP Red Orange	615	120	160	200	1.9
HSMV-A100-T00J1	AllnGaP Red Orange	617	120	250	350	2.2
HSMD-A100-L00J1	GaP Orange	602	120	10	15	2.2
HSML-A100-Q00J1	AllnGaP Orange	605	120	63	100	1.9
HSML-A101-S00J1	AllnGaP Orange	605	120	160	220	1.9
HSMY-A100-L00J1	GaP Amber	585	120	10	12	2.2
HSMA-A100-Q00J1	AllnGaP Amber	590	120	63	100	1.9
HSMA-A101-S00J1	AllnGaP Amber	590	120	160	220	1.9
HSMU-A100-S00J1	AllnGaP Amber	592	120	160	320	2.2
HSMG-A100-J02J1	GaP Yellow Green	569	120	4	18	2.2
HSME-A100-M02J1	AllnGaP Yellow Green	570	120	16	70	1.9
HSMG-A100-H01J1	GaP Emerald Green	560	120	2.5	8	2.2
HSME-A100-L01J1	AllnGaP Emerald Green	560	120	10	40	1.9
HSMM-A101-R00J1	InGaN Green	525	120	100	200	3.4
HSMM-A100-S00J1	InGaN Green	525	120	160	350	3.4
HSMK-A101-R00J1	InGaN Cyan	505	120	100	170	3.4
HSMK-A100-S00J1	InGaN Cyan	505	120	160	280	3.4
HSMB-A100-J00J1	GaN Blue	462	120	4	15	3.9
HSMN-A101-N00J1	InGaN Blue	470	120	25	50	3.4
HSMN-A100-P00J1	InGaN Blue	470	120	40	70	3.4

**Notes:**

1. The luminous intensity  $I_v$  is measured at the mechanical axis of the lamp package. The actual peak of the spatial radiation pattern may not be aligned with this axis.
2. The dominant wavelength,  $\lambda_D$ , is derived from the CIE Chromaticity Diagram and represents the color of the device.
3.  $\theta_{1/2}$  is the off-axis angle where the luminous intensity is 1/2 the peak intensity.

### Device Selection Guide

Part Number	Color	Chromaticity Coordinates		Viewing Angle $2\theta_{1/2}$ (°)	$I_v$ @ 20 mA		$V_f$ @ 20 mA Typ. (V)
		x	y		Min. (mcd)	Typ. (mcd)	
HSMW-A101-R50J1	InGaN White	0.31	0.31	120	100	–	3.4
HSMW-A100-T50J1	InGaN White	0.31	0.31	120	250	–	3.4

**Notes:**

1. The luminous intensity  $I_v$  is measured at the mechanical axis of the lamp package. The actual peak of the spatial radiation pattern may not be aligned with this axis.
2. The chromaticity coordinates are derived from the CIE 1931 Chromaticity Diagram and represents the perceived color of the device.
3.  $\theta_{1/2}$  is the off-axis angle where the luminous intensity is 1/2 the peak intensity.

# LED Solutions

## PLCC Surface Mount LEDs

### Bicolor PLCC-4 Part Numbers and Typical Product Performance

Part Number	Color 1	Color 2
HSMF-A201-xxxxx	GaP Red	GaP Yellow Green
HSMF-A202-xxxxx	GaP Red	GaP Yellow
HSMF-A203-xxxxx	GaP Red	GaP Emerald Green
HSMF-A204-xxxxx	GaP Orange	GaP Yellow Green
HSMF-A205-xxxxx	GaP Orange	GaP Emerald Green
HSMF-A206-xxxxx	GaP Yellow	GaP Yellow Green
HSMF-A211-xxxxx	AlGaAs Red	GaP Yellow Green
HSMF-A212-xxxxx	AlGaAs Red	GaP Yellow
HSMF-A222-xxxxx	AllnGaP Red	AllnGaP Amber
HSMF-A226-xxxxx	AllnGaP Amber	AllnGaP Yellow Green
HSMF-A227-xxxxx	AllnGaP Red	GaN Blue
HSMF-A228-xxxxx	AllnGaP Amber	GaN Blue

Part Number	Color 1			Color 2		
	Min. $I_v$ @ 20 mA		Typ. $I_v$ @ 20 mA	Min. $I_v$ @ 20 mA		Typ. $I_v$ @ 20 mA
	Bin ID	(mcd)	(mcd)	Bin ID	(mcd)	(mcd)
HSMF-A201-A00J1	K2	8.0	16.0	L1	10.0	20.0
HSMF-A202-A00J1	K2	8.0	16.0	K1	6.3	12.0
HSMF-A203-A00J1	K2	8.0	16.0	J1	4.0	8.0
HSMF-A204-A00J1	K2	8.0	16.0	L1	10.0	20.0
HSMF-A205-A00J1	K2	8.0	16.0	J1	4.0	8.0
HSMF-A206-A00J1	K2	8.0	16.0	L1	10.0	20.0
HSMF-A211-A00J1	L2	12.5	25.0	L1	10.0	20.0
HSMF-A212-A00J1	L2	12.5	25.0	K1	6.3	12.0
HSMF-A222-A00J1	P1	40.0	80.0	P1	40.0	80.0
HSMF-A226-A00J1	P2	50.0	100.0	M2	20.0	60.0
HSMF-A227-A00J1	P1	40.0	80.0	J2	5.0	10.0
HSMF-A228-A00J1	P1	40.0	80.0	J2	5.0	10.0

# LED Solutions

## PLCC Surface Mount LEDs

### Tricolor PLCC-4 Part Numbers and Typical Product Performance

Part Number	Color 1	Color 2	Color 3
HSMF-A301-xxxxx	GaP Red	GaP Yellow Green	GaN Blue
HSMF-A331-xxxxx	AllnGaP Red	InGaN Green	GaN Blue
HSMF-A332-xxxxx	AllnGaP Red Orange	InGaN Green	GaN Blue
HSMF-A341-xxxxx	AllnGaP Red	InGaN Green	InGaN Blue
HSMF-A342-xxxxx	AllnGaP Red Orange	InGaN Green	InGaN Blue

Part Number	Color 1			Color 2			Color 3		
	Min. $I_v$ @ 20 mA		Typ. $I_v$ @ 20 mA	Min. $I_v$ @ 20 mA		Typ. $I_v$ @ 20 mA	Min. $I_v$ @ 20 mA		Typ. $I_v$ @ 20 mA
	Bin ID	(mcd)	(mcd)	Bin ID	(mcd)	(mcd)	Bin ID	(mcd)	(mcd)
HSMF-A301-A00J1	K2	8.0	13.0	L2	12.5	20.0	K2	8.0	10.0
HSMF-A331-A00J1	P1	40.0	80.0	R1	100.0	160.0	K2	8.0	10.0
HSMF-A332-A00J1	P1	40.0	80.0	R1	100.0	160.0	K2	8.0	10.0
HSMF-A341-A00J1	P1	40.0	80.0	R1	100.0	160.0	N1	25.0	40.0
HSMF-A342-A00J1	P1	40.0	80.0	R1	100.0	160.0	N1	25.0	40.0

### Power PLCC-4 Part Numbers and Typical Product Performance

Part Number	Color	Dominant Wavelength $\lambda_p$ <sup>[1]</sup> (nm)	Viewing Angle $2\theta_{1/2}$ <sup>[2]</sup> (Degrees)	Min. $I_v$ (mcd)	Max. $I_v$ (mcd)	Typ. $V_f$ (V)	Test Current (mA)
HSMC-A400-S30M1	AllnGaP Red	626	120	160	395	2.2	50
HSMC-A401-T40M1	AllnGaP Red	626	120	250	800	2.2	50
HSMC-A401-T80M1	AllnGaP Red	626	120	310	1000	2.2	50
HSMZ-A400-U80M1	AllnGaP Red	630	120	500	1600	2.8	50
HSMJ-A401-T40M1	AllnGaP Red Orange	615	120	250	800	2.2	50
HSMJ-A401-U40M1	AllnGaP Red Orange	615	120	400	1260	2.2	50
HSMV-A400-U80M1	AllnGaP Red Orange	617	120	500	1600	2.8	50
HSMI-A401-U40M1	AllnGaP Orange	605	120	400	1260	2.2	50
HSMA-A400-T35M1	AllnGaP Amber	590	120	250	620	2.2	50
HSMA-A401-U45M1	AllnGaP Amber	590	120	400	1260	2.2	50
HSMU-A400-U85M1	AllnGaP Amber	592	120	500	1600	2.8	50
HSME-A401-P4PM1	AllnGaP Emerald Green	567	120	40	130	2.2	50
HSMM-A401-S4YM2	InGaN Green	525	120	160	500	3.8	30
HSMM-A401-S7YM2	InGaN Green	525	120	200	500	3.8	30
HSMM-A400-T8YM2	InGaN Green	525	120	310	1000	3.8	30
HSMK-A401-R40M2	InGaN Cyan	505	120	100	315	3.8	30
HSMK-A400-T80M2	InGaN Cyan	505	120	310	1000	3.8	30
HSMN-A401-P4QM2	InGaN Blue	470	120	40	130	3.8	30
HSMN-A401-P7QM2	InGaN Blue	470	120	50	130	3.8	30
HSMN-A400-Q8QM2	InGaN Blue	470	120	80	250	3.8	30

#### Notes:

1. The dominant wavelength,  $\lambda_p$ , is derived from the CIE Chromaticity Diagram and represents the color of the device.
2.  $\theta_{1/2}$  is the off-axis angle where the luminous intensity is 1/2 the peak intensity.
3. The luminous intensity,  $I_v$ , is measured at the mechanical axis of the lamp package. The actual peak of the spatial radiation pattern may not be aligned with this axis.

# LED Solutions

## PLCC Surface Mount LEDs

### PLCC 4 White Device Selection Guide

Part Number	Color	Chromaticity Coordinates		Viewing Angle $2\theta_{1/2}$ (°)	$I_v$ @ 30 mA			VF @ 30 mA Typ. (V)
		x	y		Min. (mcd)	Typ. (mcd)	Max. (mcd)	
HSMW-A400-T00M2	InGaN White	0.31	0.31	120	285.00	560.00	-	3.8
HSMW-A400-U00M2	InGaN White	0.31	0.31	120	450.00	700.00	-	3.8
ASMT-SWBM-NU803 <sup>[5]</sup>	InGaN White	0.318	0.318	120	560.00	1100.00	1400.00	3.5

**Notes:**

1. The luminous intensity  $I_v$ , is measured at the mechanical axis of the lamp package. The actual peak of the spatial radiation pattern may not be aligned with this axis.
2.  $I_v$  Tolerance =  $\pm 12\%$
3. The chromaticity coordinates are derived from the CIE 1931 Chromaticity Diagram and represent the perceived color of the device.
4.  $\theta_{1/2}$  is the off-axis angle where the luminous intensity is  $1/2$  the peak intensity.
5. Long Life White Device

### Power PLCC-4 with Lens Part Numbers and Typical Product Performance

Part Number	Color	Dominant Wavelength $\lambda_D$ <sup>(1)</sup> (nm)	Viewing Angle $2\theta_{1/2}$ (°)	Min. $I_v$ (mcd)	Max. $I_v$ (mcd)	Typ. $V_f$ (V)	Test Current (mA)
HSMC-A430-W50M1	AllnGaP Red	626	30	1125	3550	2.2	50
HSMC-A431-X90M1	AllnGaP Red	626	30	2240	7150	2.2	50
HSMJ-A430-W50M1	AllnGaP Red Orange	615	30	1125	3550	2.2	50
HSMJ-A431-X90M1	AllnGaP Red Orange	615	30	2240	7150	2.2	50
HSMV-A430-Y90M1	AllnGaP Red Orange	617	30	3500	11250	2.8	50
HSML-A431-X90M1	AllnGaP Orange	605	30	2240	7150	2.2	50
HSMA-A430-W90M1	AllnGaP Amber	590	30	1400	4500	2.2	50
HSMA-A431-Y00M1	AllnGaP Amber	590	30	2850	-	2.2	50
HSMA-A431-X90M1	AllnGaP Amber	590	30	2240	7150	2.2	50
HSMN-A430-W90M1	InGaN Green	525	30	1400	4500	3.9	30
HSMN-A430-U50M2	InGaN Blue	470	30	450	1400	3.9	30
HSMN-A431-T50M2	InGaN Blue	470	30	285	900	3.9	30

**Notes:**

1. The luminous intensity,  $I_v$ , is measured at the mechanical axis of the lamp package. The actual peak of the spatial radiation pattern may not be aligned with this axis.
2.  $I_v$  tolerance  $\pm 12\%$
3. The dominant wavelength,  $\lambda_D$ , is derived from the CIE Chromaticity Diagram and represents the color of the device.
4.  $\theta_{1/2}$  is the off-axis angle where the luminous intensity is  $1/2$  the peak intensity.

# LED Solutions

## PLCC Surface Mount LEDs

### Intensity Bin Select ( $X_5, X_6$ )

Individual reel will contain parts from 1 half bin only. Single color (see data sheet for bicolor and tricolor).

$X_5$	Minimum Iv Bin
$X_6$	
0	Full Distribution
3	3 half bins starting from $X_5,1$
4	4 half bins starting from $X_5,1$
5	5 half bins starting from $X_5,1$
7	3 half bins starting from $X_5,2$
8	4 half bins starting from $X_5,2$
9	5 half bins starting from $X_5,2$

### Color Bin Select ( $X_7$ )

Individual reel will contain parts from 1 full bin only. Single color (see data sheet for bicolor and tricolor).

$X_7$	
0	Full Distribution
Z	A and B only
Y	B and C only
W	C and D only
V	D and E only
U	E and F only
T	F and G only
S	G and H only
Q	A, B and C only
P	B, C and D only
N	C, D and E only
M	D, E and F only
L	E, F and G only
K	F, G and H only
1	A, B, C and D only
2	E, F G and H only
3	B, C, D and E only
4	C, D, E and F only
5	A, B, C, D and E only
6	B, C, D, E and F only

### Color Bin Limits (HSMW-Axxx)

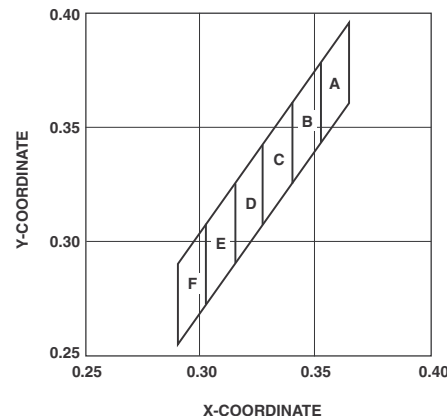
Bin ID	Limits (Chromaticity Coordinates)
A	X 0.352 0.365 0.365 0.352
	Y 0.377 0.395 0.360 0.341
B	X 0.340 0.352 0.352 0.340
	Y 0.360 0.377 0.341 0.325
C	X 0.327 0.340 0.340 0.327
	Y 0.342 0.360 0.325 0.306
D	X 0.315 0.327 0.327 0.315
	Y 0.325 0.342 0.306 0.290
E	X 0.302 0.315 0.315 0.302
	Y 0.307 0.325 0.290 0.271
F	X 0.290 0.302 0.302 0.290
	Y 0.290 0.307 0.271 0.255

Tolerance of each bin limit =  $\pm 0.02$ .

### Intensity Bin Limits

Bin ID	Intensity (mcd)	
	Min.	Max.
J1	4.50	5.60
J2	5.60	7.20
K1	7.20	9.00
K2	9.00	11.20
L1	11.20	14.00
L2	14.00	18.00
M1	18.00	22.40
M2	22.40	28.50
N1	28.50	35.50
N2	35.50	45.00
P1	45.00	56.00
P2	56.00	71.50
Q1	71.50	90.00
Q2	90.00	112.50
R1	112.50	140.00
R2	140.00	180.00
S1	180.00	224.00
S2	224.00	285.00
T1	285.00	355.00
T2	355.00	450.00
U1	450.00	560.00
U2	560.00	715.00
V1	715.00	900.00
V2	900.00	1125.00
W1	1125.00	1400.00
W2	1400.00	1800.00
X1	1800.00	2240.00
X2	2240.00	2850.00
Y1	2850.00	3550.00
Y2	3550.00	4500.00
Z1	4500.00	5600.00
Z2	5600.00	7150.00
11	7150.00	9000.00
12	9000.00	11250.00
21	11250.00	14000.00
22	14000.00	18000.00

Tolerance of each bin limit =  $\pm 12\%$



### Color Bin Limits

Color/Bin	Wavelength (nm)	
	Min.	Max.
<b>Blue</b>		
A	460.0	465.0
B	465.0	470.0
C	470.0	475.0
D	475.0	480.0
<b>Cyan</b>		
A	490.0	495.0
B	495.0	500.0
C	500.0	505.0
D	505.0	510.0
<b>Green</b>		
A	515.0	520.0
B	520.0	525.0
C	525.0	530.0
D	530.0	535.0
<b>Yellow Green/Emerald Green</b>		
A	552.5	555.5
B	555.5	558.5
C	558.5	561.5
D	561.5	564.5
E	564.5	567.5
F	567.5	570.5
G	570.5	573.5
H	573.5	576.5
<b>Amber</b>		
A	582.0	584.5
B	584.5	587.0
C	587.0	589.5
D	589.5	592.0
E	592.0	594.5
F	594.5	597.0
<b>Orange</b>		
A	597.0	600.0
B	600.0	603.0
C	603.0	606.0
D	606.0	609.0
E	609.0	612.0
<b>Red Orange</b>		
A	611.0	616.0
B	616.0	620.0
<b>Red</b>		
Full Distribution		

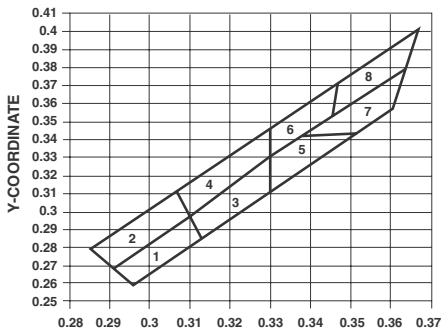
Tolerance of each bin limit =  $\pm 1\text{nm}$

# LED Solutions

Color Bin Limits (ASMT-SWBM-Nxxx)

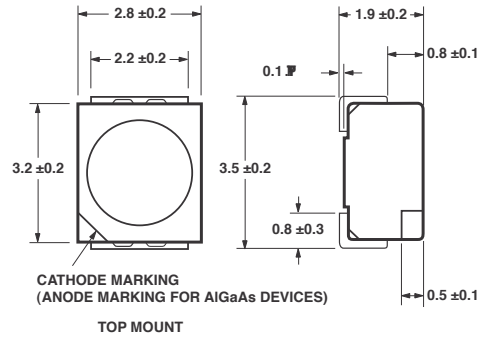
Bin ID	Limits (Chromaticity Coordinates)				
1	x	0.296	0.291	0.310	0.313
	y	0.259	0.268	0.297	0.284
2	x	0.291	0.285	0.307	0.310
	y	0.268	0.279	0.312	0.297
3	x	0.313	0.310	0.330	0.330
	y	0.284	0.297	0.330	0.310
4	x	0.310	0.307	0.330	0.330
	y	0.297	0.312	0.347	0.330
5	x	0.330	0.330	0.338	0.352
	y	0.310	0.330	0.342	0.344
6	x	0.330	0.330	0.347	0.345
	y	0.330	0.347	0.371	0.352
7	x	0.352	0.338	0.364	0.360
	y	0.344	0.342	0.380	0.357
8	x	0.345	0.347	0.367	0.364
	y	0.352	0.371	0.401	0.380

Tolerance of each bin limit =  $\pm 0.02$ .

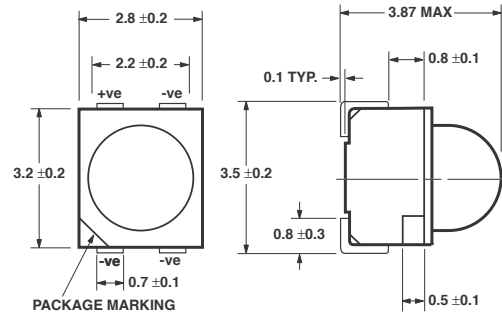
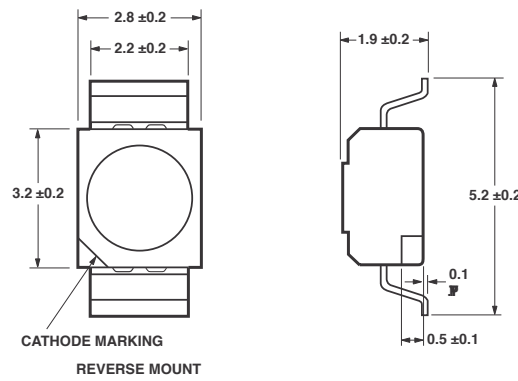


## Package Dimensions

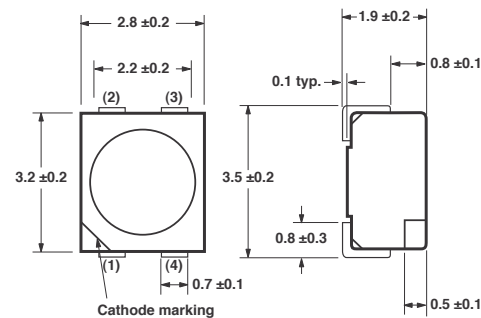
### Single Color Top Mount



### Single Color Reverse Mount



### BiColor/TriColor PLCC4/Power PLCC-4



Packaging Option (X<sub>8</sub>X<sub>9</sub>)

Option	Test Current	Package Type	Reel Size
M1	50 mA	Top Mount	7/13 Inch
M2	30 mA	Top Mount	7/13 Inch
J1	20 mA	Top Mount	7 Inch
J4	20 mA	Top Mount	13 Inch
H1	20 mA	Reverse Mount	7 Inch
H4	20 mA	Reverse Mount	13 Inch

### Tricolor/Power PLCC-4

1	Cathode (Color 1)
2	Common Anode
3	Cathode (Color 3)
4	Cathode (Color 2)

### Bicolor PLCC-4

1	Cathode (Color 1)
2	Anode (Color 1)
3	Cathode (Color 2)
4	Anode (Color 2)

NOTE: ALL DIMENSIONS IN MILLIMETERS.



## Envisium Power PLCC-4 Surface Mount LEDs

### Description

Envisium Power PLCC-4 (plastic leaded chip carrier) surface-mount (SMT) LEDs represent the premier class of mid-power LEDs from Avago Technologies and Lumileds Lighting, utilizing the very best solid-state lighting technologies from these two industry leaders. Envisium Power PLCC-4 SMT LEDs offer unparalleled performance, reliability and design flexibility. These LEDs produce higher light output with better flux performance compared to conventional PLCC-4 SMT LEDs.

Envisium Power PLCC-4 SMT LEDs, available in red, red-orange and amber, fill the need for mid-power illumination capabilities between Avago Technologies' conventional PLCC-4 products, operating at up to 200 mW power levels, and Lumileds Lighting's Luxeon LED light sources that operate at power levels of 1 watt and higher. The Power PLCC-4 package can be driven at high current due to its superior design, and is able to dissipate the heat more efficiently than conventional PLCC-2 SMT LEDs. It also offers much higher quality and reliability and superior mechanical characteristics to reduce tombstoning, prevent delamination and improve pick-and-place assembly.

The reliability and performance characteristics of these mid-power LEDs, such as their  $-40^{\circ}\text{C}$  to  $+100^{\circ}\text{C}$  operating temperature range, make them uniquely suitable for use in harsh conditions such as automotive applications, and in electronic signs and signals. To facilitate easy pick and place assembly, the LEDs are packed in EIA-compliant tape and reel. Every reel is shipped in single intensity and color bin (except for red) to provide close uniformity.

These LEDs are compatible with both IR solder reflow and through-the-wave (TTW) soldering processes.

### Features and Benefits

- Industry Standard PLCC-4 (plastic leaded chip carrier) form factor
- High reliability Power PLCC-4 package
- Mid-power intensity with optimum flux performance using TS AlInGaP (transparent substrate aluminum indium gallium phosphide) dice technologies
- Available in red, red orange and amber colors
- High optical efficiency
- Higher ambient temperature at the same current possible compared to PLCC-2
- Super wide 120-degree viewing angle
- Well-suited for backlighting applications
- Supplied in EIA-standard 8 mm carrier tape on 7 inch reel
- Compatible with both IR and TTW soldering processes

### Applications

- Interior automotive
  - Instrument panel backlighting
  - Central console backlighting
  - Navigation and audio system lighting
  - Push button backlighting
- Exterior automotive
  - Turn signals
  - Side repeater lamps
  - CHMSLs (center high-mounted stop light)
  - Rear combination lamps
  - Puddle lights
- Electronic signs and signals
  - Channel lettering
  - Contour lighting
  - Indoor variable message signs
- Office automation, home appliances, industrial equipment
  - Front panel backlighting
  - Push button backlighting
  - Display backlighting

# LED Solutions

## Device Selection Guide

### Envisium 0.25W Power PLCC-4 Surface Mount LED

Part Number	Color	Typ. Dominant Wavelength $\lambda_D$ (nm) <sup>1</sup>	Typ. Viewing Angle $2\theta_{1/2}$ (°) <sup>2</sup>	Intensity Bin	Min. IV (mcd)	Max. IV (mcd)	Total Flux $\Phi_V$ (mlm) <sup>4,5</sup> Typ.	Typ. Vf (V)	Test Current (mA)
ASMC-PRB9-TV005	AllnGaP Red	630.0	120	V1	630.00	1000.00	2600.00	2.8	50
		630.0	120	V2	790.00	1260.00	3300.00	2.8	50
		630.0	120	W1	1000.00	1600.00	–	2.8	50
ASMC-PHB9-TW005	AllnGaP Red Orange	617.0	120	W1	1000.00	1600.00	4300.00	2.8	50
		617.0	120	W2	1200.00	2020.00	5000.00	2.8	50
		617.0	120	X1	1580.00	2500.00	–	2.8	50
ASMC-PAB9-TV005	AllnGaP Amber	592.0	120	V1	630.00	1000.00	3000.00	2.8	50
		592.0	120	V2	790.00	1260.00	3800.00	2.8	50
		592.0	120	W1	1000.00	1600.00	–	2.8	50

**Notes:**

1. The dominant wavelength,  $\lambda_D$ , is derived from the CIE Chromaticity Diagram and represents the color of the device.
2.  $\theta_{1/2}$  is the off-axis angle where the luminous intensity is 1/2 the peak intensity.
3. The luminous intensity,  $I_v$ , is measured at the mechanical axis of the lamp package. The actual peak of the spatial radiation pattern may not be aligned with this axis.
4.  $\Phi$  is the total luminous flux output as measured with an integrating sphere after the device has stabilized.
5. Flux tested at mono pulse conditions.

### Envisium 0.5W Power PLCC-4 Surface Mount LED

Part Number	Color	Typ. Dominant Wavelength $\lambda_D$ (nm) <sup>1</sup>	Typ. Viewing Angle $2\theta_{1/2}$ (°) <sup>2</sup>	Flux Bin	Min. Flux (lm)	Max. Flux (lm)	Typ. Vf (V)	Test Current (mA)	Dice Technology
ASMC-QAB2-TAC0E	Amber	593.5	120	A	4.3	5.5	2.64	150	AllnGaP
				B	5.5	7.0		150	
				C	7.0	9.0		150	
ASMC-QHB2-TCDOE	Red Orange	619.3	120	C	7.0	9.0	2.64	150	AllnGaP
				D	9.0	11.5		150	

**Notes:**

1. The dominant wavelength,  $\lambda_D$ , is derived from the CIE Chromaticity Diagram and represents the color of the device.
2.  $\theta_{1/2}$  is the off-axis angle where the luminous intensity is 1/2 the peak intensity.
3. The luminous intensity,  $I_v$ , is measured at the mechanical axis of the lamp package. The actual peak of the spatial radiation pattern may not be aligned with this axis.
4.  $\Phi$  is the total luminous flux output as measured with an integrating sphere after the device has stabilized.
5. Flux tested at mono pulse conditions.

### Intensity Bin Select ( $X_2, X_3$ )

An individual reel will contain parts from one half bin only

$X_2, X_3$	Min. $I_v$ Bin
0	Full Description
3	3 half bins starting from $X_2, 1$
4	4 half bins starting from $X_2, 1$
5	5 half bins starting from $X_2, 1$
7	3 half bins starting from $X_2, 1$
8	4 half bins starting from $X_2, 1$
9	5 half bins starting from $X_2, 1$

### Intensity Bin Limits and Typical Flux

Bin ID	Min. (mcd)	Max. (mcd)
V1	715.00	900.00
V2	900.00	1125.00
W1	1125.00	1400.00
W2	1400.00	1800.00
X1	1800.00	2240.00
X2	2240.00	2850.00

Tolerance of each bin limit =  $\pm 12\%$



# LED Solutions

## Color Bin Select ( $X_2$ )

An individual reel will contain parts from one half bin only

$X_2$	
0	Full Distribution
A	1 and 2 only
B	2 and 3 only
C	3 and 4 only
D	4 and 5 only
E	5 and 6 only
F	6 and 7 only
G	1, 2 and 3 only
H	2, 3 and 4 only
J	3, 4 and 5 only
K	4, 5 and 6 only
L	5, 6 and 7 only
M	1, 2, 3 and 4 only
N	2, 3, 4 and 5 only
P	3, 4, 5 and 6 only
Q	4, 5, 6 and 7 only
R	1, 2, 3, 4 and 5 only
S	2, 3, 4, 5 and 6 only

## Color Bin Limits

Amber/ Yellow	Min. (nm)	Max. (nm)
1	582.0	584.5
2	584.5	587.0
3	587.0	589.5
4	589.5	592.0
5	592.0	594.5
6	594.5	597.0

Red Orange	Min. (nm)	Max. (nm)
1	611.0	616.0
2	616.0	620.0

Red	Min. (nm)	Max. (nm)
Full Distribution		

Tolerance of each bin limit =  $\pm 1$  nm

## Packaging Option ( $X_3$ )

Option	Test Current	Package Type	Reel Size
5	50 mA	Top Mount	7 inch

## Color Bin Select ( $X_4$ )

An individual reel will contain parts from one half bin only

$X_4$	
0	Full Distribution
A	1 and 2 only
B	2 and 3 only
C	3 and 4 only
D	4 and 5 only
E	5 and 6 only
G	1, 2 and 3 only
H	2, 3 and 4 only
J	3, 4 and 5 only
K	4, 5 and 6 only
M	1, 2, 3 and 4 only
N	2, 3, 4 and 5 only
P	3, 4, 5 and 6 only
R	1, 2, 3, 4 and 5 only
S	2, 3, 4, 5 and 6 only
Z	Special Color Bin

## Flux Bin Select ( $X_2, X_3$ )

An individual reel will contain parts from one half bin only

$X_2$	Min. Flux Bin
$X_3$	Max. Flux Bin

## Flux Bin Limits

BIN ID	Min. (lm)	Max. (lm)
A	4.30	5.50
B	5.50	7.00
C	7.00	9.00
D	9.00	11.50
E	11.50	15.00
F	15.00	19.50
G	19.50	25.50
H	25.50	33.00
I	33.00	43.00
J	43.00	56.00
K	56.00	73.00

Tolerance of each bin limit =  $\pm 0.12\%$

## Color Bin Limits

Amber/ Yellow	Min. (nm)	Max. (nm)
2	583.0	586.0
3	586.0	589.0
4	589.0	592.0
5	592.0	595.0
6	595.0	598.0

Red Orange	Min. (nm)	Max. (nm)
1	611.0	616.0
2	616.0	620.0
3	620.0	625.0

## $V_f$ Binning

Bin	Min.	Max.
2D	2.35	2.50
2E	2.50	2.65
2F	2.65	2.80
2G	2.80	2.95
2H	2.95	3.10
2J	3.10	3.25

Tolerance of each bin limit =  $\pm 0.1V$

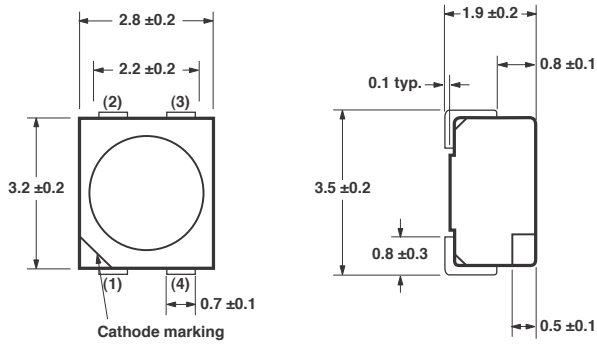
## Packaging Option ( $X_3$ )

Option	Test Current	Package Type	Reel Size
E	150 mA	Top Mount	7 inch

# LED Solutions

## Package Dimensions

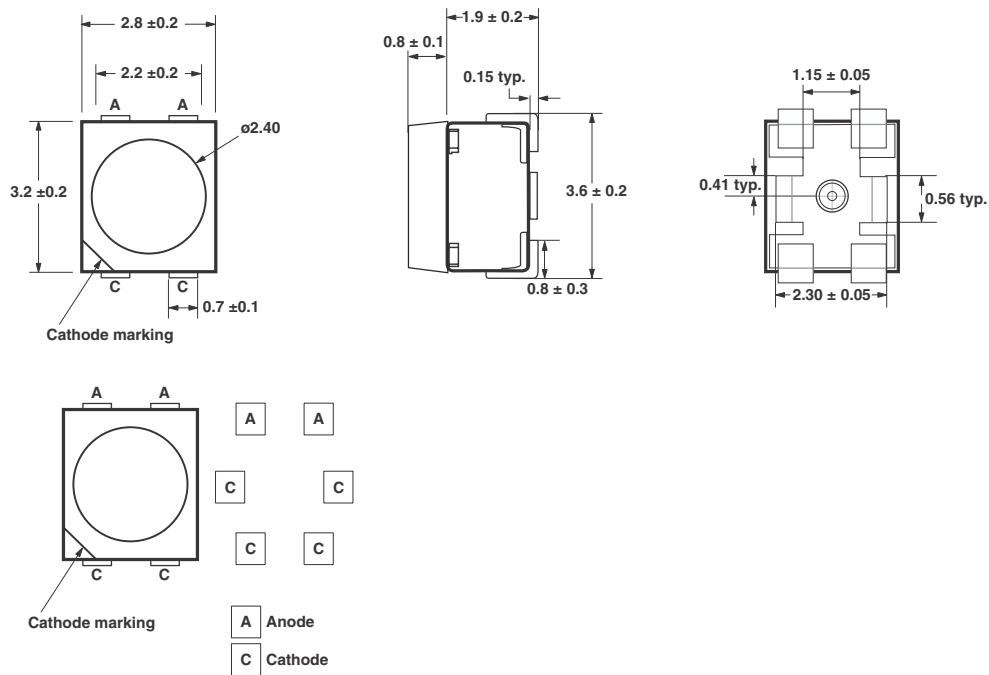
### Envisium 0.25W Power PLCC-4



Note: All dimensions in mm

Envisium Power PLCC-4	
1	Cathode
2	Common Anode
3	Cathode
4	Cathode

### Envisium 0.5W Power PLCC-4



# LED Indicators and Displays



## Surface Mount ChipLEDs

### Description

For applications that require small size, high efficiency and low power consumption, Avago Technologies offers an extensive range of high quality ChipLEDs to meet demands for virtually any surface mount lighting requirement.

Avago Technologies' ChipLEDs are available in standard and high-brightness colors, using Avago Technologies' proven AlGaAs, AlInGaP and InGaN processes to give you the broadest range of colors from a single supplier.

Avago's ChipLEDs use the industry standard footprint, with top-mount, reverse-mount and right-angle-mount packaging options. They also have the lowest profile in the industry and are positioned to support high volume, cost-effective solutions.

ChipLED products are used in a variety of applications including LCD and push button backlighting for cellular phones, white goods and appliances, industrial measurement and control systems, and for symbol lighting and status indication in computer peripherals and consumer goods.

Low power consumption, small size and easy assembly make the ChipLED ideal for backlighting handsets as well as backlighting industrial displays.

### Features and Benefits

- Small size
  - Saves PC board space
- Wide viewing angle
  - Well-suited for backlighting applications
- Intensity and color bin uniformity
  - Can be closely mounted without any intensity variations
- Available in multiple colors
  - Amber, Red, AlGaAs Red, Green, Orange, Yellow, InGaN Blue, InGaN Green, bicolor and tricolor combinations
- Variety of packages and mounting options
  - Top, reverse and right angle auto mountable
- Industry standard footprint
  - No change in existing board layout
- High volume, high reliability
  - Cost-effective solution

### Typical Applications

- Telecommunications
  - Keypad and LCD backlighting for mobile phones, pagers and cordless phones
- Industrial
  - Status and symbol indicator
  - Keypad and LCD backlighting
- Consumer
  - White goods and appliances
- Computer Peripherals
  - Status indicator
- Indoor Full/Mono color sign

# LED Indicators and Displays

## Surface Mount ChipLEDs

Part Number	Color	Dominant Wavelength (nm)	Viewing Angle	Lens	Intensity		Vf Typ. (V)	Test Current (mA)
					Min. (mcd)	Typ. (mcd)		
<b>Top Mount (C150)</b>								
<b>3.2 x 1.6 x 1.1 mm (L x W x H)</b>								
HSMH-C150	AS AlGaAs Red	639	170°	Diffused	7.2	17	1.8	20
HSMO-C150	GaP Orange	604	170°	Diffused	2.8	8	2.2	20
HSMG-C150	GaP Green	572	170°	Diffused	4.5	15	2.2	20
HSMR-C150	GaP Red	626	170°	Diffused	2.8	10	2.1	20
HSMY-C150	GaP Yellow	586	170°	Diffused	2.8	8	2.1	20
HSMQ-C150	InGaN Green	527	140°	Diffused	45	145	3.4	20
HSMR-C150	InGaN Blue	473	140°	Diffused	18	55	3.4	20

Quantity: 3,000 per 7 inch reel

<b>Top Mount Low Profile (C170)</b>								
<b>2.0 x 1.25 x 0.8 mm (L x W x H)</b>								
HSMH-C170	AS AlGaAs Red	639	170°	Diffused	7.2	17	1.8	20
HSMO-C170	GaP Orange	604	170°	Diffused	2.8	8	2.2	20
HSMG-C170	GaP Green	572	170°	Diffused	4.5	15	2.2	20
HSMR-C170	GaP Red	626	170°	Diffused	2.8	10	2.1	20
HSMY-C170	GaP Yellow	586	170°	Diffused	2.8	8	2.1	20
HSMO-C170	AS AllnGaP Amber	592	170°	Diffused	28.5	90	1.9	20
HSMC-C170	AS AllnGaP Red	626	170°	Diffused	28.5	90	1.9	20
HSMO-C170	AS AllnGaP Orange	605	170°	Diffused	28.5	90	1.9	20
HSMB-C170	GaN Blue	466	170°	Diffused	1.8	6	3.8	20
HSMZ-C170	TS Red	631	170°	Diffused	45	165	2.2	20
HSMO-C170	InGaN Green	525	170°	Diffused	45	120	3.3	20
HSMO-C170	InGaN Blue	470	170°	Diffused	11.2	35	3.3	20
HSMQ-C170	InGaN Green	527	140°	Diffused	45	145	3.4	20
HSMR-C170	InGaN Blue	473	140°	Diffused	18	55	3.4	20

Quantity: 4,000 per 7 inch reel

<b>Top Mount Low Profile (C190)</b>								
<b>1.6 x 0.8 x 0.8 mm (L x W x H)</b>								
HSMH-C190	AS AlGaAs Red	639	170°	Diffused	7.2	17	1.8	20
HSMO-C190	GaP Orange	604	170°	Diffused	2.8	8	2.2	20
HSMG-C190	GaP Green	572	170°	Diffused	4.5	5	2.2	20
HSMR-C190	GaP Red	626	170°	Diffused	2.8	10	2.1	20
HSMY-C190	GaP Yellow	586	170°	Diffused	2.8	8	2.1	20
HSMO-C190	AS AllnGaP Amber	592	170°	Diffused	28.5	90	1.9	20
HSMC-C190	AS AllnGaP Red	626	170°	Diffused	28.5	90	1.9	20
HSMO-C190	AS AllnGaP Orange	605	170°	Diffused	28.5	90	1.9	20
HSMZ-C190	TS Red	631	170°	Diffused	45	165	2.2	20
HSMB-C190	GaN Blue	466	170°	Diffused	1.8	6	3.8	20
HSMO-C190	InGaN Green	525	170°	Diffused	45	120	3.3	20
HSMO-C190	InGaN Blue	470	170°	Diffused	11.2	35	3.3	20
HSMQ-C190	InGaN Green	527	140°	Diffused	45	145	3.4	20
HSMR-C190	InGaN Blue	473	140°	Diffused	18	55	3.4	20

Quantity: 4,000 per 7 inch reel

# LED Indicators and Displays

## Surface Mount ChipLEDs

Part Number	Color	Dominant Wavelength (nm)	Viewing Angle	Lens	Intensity		Vf Typ. (V)	Test Current (mA)
					Min. (mcd)	Typ. (mcd)		
<b>Top Mount Very Low Profile (C191)</b>								
<b>1.6 x 0.8 x 0.6 mm (L x W x H)</b>								
HSMH-C191	AS AlGaAs Red	639	170°	Diffused	7.2	17	1.8	20
HSMC-C191	GaP Orange	604	170°	Diffused	2.8	8	2.2	20
HSMG-C191	GaP Green	572	170°	Diffused	4.5	5	2.2	20
HSMS-C191	GaP Red	626	170°	Diffused	2.8	10	2.1	20
HSMY-C191	GaP Yellow	586	170°	Diffused	2.8	8	2.1	20
HSMC-C191	AS AlInGaP Amber	592	170°	Diffused	28.5	90	1.9	20
HSMC-C191	AS AlInGaP Red	626	170°	Diffused	28.5	90	1.9	20
HSMC-C191	AS AlInGaP Orange	605	170°	Diffused	28.5	90	1.9	20
HSMN-C191	InGaN Blue	470	170°	Diffused	11.2	35	3.3	20
HSMQ-C191	InGaN Green	527	140°	Diffused	45	145	3.4	20
HSMR-C191	InGaN Blue	473	140°	Diffused	18	55	3.4	20

Quantity: 4,000 per 7 inch reel

<b>Right Angle (C110)</b>								
<b>3.2 x 1.0 x 1.5 mm (L x W x H)</b>								
HSMH-C110	AS AlGaAs Red	639	130°	Non-diffused	7.2	17	1.8	20
HSMC-C110	GaP Orange	604	130°	Non-diffused	2.8	8	2.2	20
HSMG-C110	GaP Green	572	130°	Non-diffused	4.5	15	2.2	20
HSMS-C110	GaP Red	626	130°	Non-diffused	2.8	10	2.1	20
HSMY-C110	GaP Yellow	586	130°	Non-diffused	2.8	8	2.1	20
HSMC-C110	AS AlInGaP Amber	592	130°	Non-diffused	28.5	95	1.9	20
HSMC-C110	AS AlInGaP Red	626	130°	Non-diffused	28.5	95	1.9	20
HSMC-C110	AS AlInGaP Orange	605	130°	Non-diffused	28.5	95	1.9	20
HSMB-C110	GaN Blue	466	130°	Non-diffused	1.8	6.5	3.8	20
HSMZ-C110	TS Red	631	130°	Non-diffused	45	170	2.2	20
HSMN-C110	InGaN Green	525	130°	Non-diffused	45	126	3.3	20
HSMN-C110	InGaN Blue	470	130°	Non-diffused	11.2	39	3.3	20
HSMQ-C110	InGaN Green	527	130°	Non-diffused	45	150	3.4	20
HSMR-C110	InGaN Blue	473	130°	Non-diffused	18	60	3.4	20

Quantity: 3,000 per 7 inch reel

<b>Reverse Mount (C265)</b>								
<b>3.4 x 1.25 x 1.1 mm (L x W x H)</b>								
HSMC-C265	AS AlInGaP Amber	592	150°	Non-diffused	28.5	75	1.9	20
HSMC-C265	AS AlInGaP Red	626	150°	Non-diffused	28.5	75	1.9	20
HSMC-C265	AS AlInGaP Green	572	170°	Non-diffused	18	50	2.1	20
HSMC-C265	AS AlInGaP Orange	605	150°	Non-diffused	28.5	75	1.9	20
HSMG-C265	GaP Green	572	170°	Non-diffused	4.5	15	2.2	20
HSMH-C265	AS AlGaAs Red	639	170°	Non-diffused	7.2	17	1.8	20

Quantity: 3,000 per 7 inch reel

# LED Indicators and Displays

## Surface Mount ChipLEDs

Part Number	Color	Dominant Wavelength (nm)	Viewing Angle	Lens	Intensity		Vf Typ. (V)	Test Current (mA)
					Min. (mcd)	Typ. (mcd)		
<b>Bicolor (C15x)</b>								
<b>3.2 x 2.7 x 1.1 mm (L x W x H)</b>								
HSMF-C155	GaP Green GaP Red	572	170°	Diffused	4.5	15	2.2	20
		626	170°	Diffused	2.8	10	2.1	20
HSMF-C156	GaP Green GaP Yellow	572	170°	Diffused	4.5	15	2.2	20
		586	170°	Diffused	2.8	8	2.1	20
HSMF-C157	GaP Green GaP Orange	572	170°	Diffused	4.5	15	2.2	20
		604	170°	Diffused	2.8	8	2.2	20

Quantity: 3,000 per 7 inch reel

<b>Tricolor (C113)</b>								
<b>2.5 x 1.0 x 1.0 mm (L x W x H)</b>								
HSMF-C113	AllInGaP Red	626	120°	Diffused	28.5	80	1.9	20
	AllInGaP Green	572	125°	Diffused	18	50	2	20
	InGa Blue	470	125°	Diffused	28.5	60	3.4	20

Quantity: 3,000 per 7 inch reel

<b>Tricolor (C114)</b>								
<b>1.6 x 1.5 x 0.35 mm (L x W x H)</b>								
HSMF-C114	AllInGaP Red	626	140°	Diffused	28.5	85	1.9	20
	InGa Green	525	145°	Diffused	45	180	3.4	20
	InGa Blue	470	145°	Diffused	28.5	70	3.4	20

Quantity: 4,000 per 7 inch reel

<b>Tricolor (C115)</b>								
<b>2.5 x 1.0 x 1.0 mm (L x W x H)</b>								
HSMF-C115	AllInGaP Red	626	120°	Diffused	28.5	80	1.9	20
	InGa Green	525	125°	Diffused	71.5	170	3.4	20
	InGa Blue	470	125°	Diffused	28.5	60	3.4	20

Quantity: 3,000 per 7 inch reel

<b>TriColor (C118)</b>								
<b>3.2 x 2.7 x 1.1 mm (L x W x H)</b>								
HSMF-C118	GaP Green	525	130°	Diffused	45	120	3.5	20
	AllInGaP Red	626	135°	Diffused	28.5	90	1.9	20
	InGa Blue	470	125°	Diffused	11.2	40	3.5	20

Quantity: 3,000 per 7 inch reel

### The SIZE DOES MATTER Series

<b>World's Smallest Top Mount (C280)</b>								
<b>1.0 x 0.5 x 0.4 mm</b>								
HSMC-C280	AS AllInGaP Amber	592	130°	Diffused	28.5	90	1.9	20
HSMC-C280	AS AllInGaP Red	626	130°	Diffused	28.5	90	1.9	20
HSMG-C280	GaP Green	572	130°	Diffused	4.5	15	2.2	20
HSMC-C280	GaP Red	626	130°	Diffused	2.8	10	2.1	20
HSMY-C280	GaP Yellow	586	130°	Diffused	2.8	8	2.1	20

Quantity: 4,000 per 7 inch reel

# LED Indicators and Displays

## Surface Mount ChipLEDs

Part Number	Color	Dominant Wavelength (nm)	Viewing Angle	Lens	Intensity		Vf Typ. (V)	Test Current (mA)
					Min. (mcd)	Typ. (mcd)		
<b>Top Mount Very Low Profile (C177)</b>								
<b>2.0 x 1.25 x 0.4 mm</b>								
HSMC-C177	GaP Orange	604	130°	Diffused	2.8	8	2.2	20
HSMG-C177	GaP Green	572	130°	Diffused	4.5	5	2.2	20
HSMC-C177	GaP Red	626	130°	Diffused	2.8	10	2.1	20
HSMC-C177	AS AlInGaP Amber	592	130°	Diffused	28.5	90	1.9	20
HSMC-C177	AS AlInGaP Red	626	130°	Diffused	28.5	90	1.9	20
HSMC-C177	AS AlInGaP Orange	605	130°	Diffused	28.5	90	1.9	20

Quantity: 4,000 per 7 inch reel

<b>Top Mount Very Low Profile (C197)</b>								
<b>1.6 x 0.8 x 0.4 mm (L x W x H)</b>								
HSMC-C197	GaP Orange	604	130°	Diffused	2.8	8	2.2	20
HSMG-C197	GaP Green	572	130°	Diffused	4.5	5	2.2	20
HSMC-C197	GaP Red	626	130°	Diffused	2.8	10	2.1	20
HSMY-C197	GaP Yellow	586	130°	Diffused	2.8	8	2.1	20
HSMC-C197	AS AlInGaP Amber	592	130°	Diffused	28.5	90	1.9	20
HSMC-C197	AS AlInGaP Red	626	130°	Diffused	28.5	90	1.9	20
HSMC-C197	AS AlInGaP Orange	605	130°	Diffused	28.5	90	1.9	20

Quantity: 4,000 per 7 inch reel

<b>World's Smallest Right Angle (C120)</b>								
<b>1.6 x 0.6 x 1.0 mm (L x W x H)</b>								
HSMH-C120	AS AlGaAs	639	155°	Non-diffused	7.2	17	1.8	20
HSMC-C120	GaP Orange	604	155°	Non-diffused	2.8	8	2.2	20
HSMG-C120	GaP Green	572	155°	Non-diffused	4.5	15	2.2	20
HSMC-C120	AS AlInGaP Amber	592	155°	Non-diffused	28.5	90	1.9	20
HSMC-C120	AS AlInGaP Red	626	155°	Non-diffused	28.5	90	1.9	20
HSMC-C120	AS AlInGaP Orange	605	155°	Non-diffused	28.5	90	1.9	20
HSMC-C120	InGaN Green	525	155°	Non-diffused	45	120	3.4	20
HSMC-C120	InGaN Blue	470	155°	Non-diffused	11.2	30	3.4	20
HSMC-C120	InGaN Green	527	155°	Non-diffused	45	145	3.4	20
HSMC-C120	InGaN Blue	473	155°	Non-diffused	18	55	3.4	20

Quantity: 4,000 per 7 inch reel

<b>World's Smallest Bicolor (C16x)</b>								
<b>1.6 x 0.8 x 0.5 mm</b>								
HSMF-C165	GaP Green	572	120°	Diffused	4.5	15	2.2	20
	GaP Red	626	120°	Diffused	2.8	10	2.1	20
HSMF-C166	GaP Green	572	120°	Diffused	4.5	15	2.2	20
	GaP Yellow	586	120°	Diffused	2.8	8	2.1	20
HSMF-C167	GaP Green	572	120°	Diffused	4.5	15	2.2	20
	GaP Orange	604	120°	Diffused	2.8	8	2.2	20

Quantity: 4,000 per 7 inch reel

# LED Indicators and Displays

## Surface Mount ChipLEDs

### Standard Intensity Categories

Bin ID	Intensity (mcd)	
	Min.	Max.
A	0.11	0.18
B	0.18	0.29
C	0.29	0.45
D	0.45	0.72
E	0.72	1.10
F	1.10	1.80
G	1.80	2.80
H	2.80	4.50
J	4.50	7.20
K	7.20	11.20
L	11.20	18.00
M	18.00	28.50
N	28.50	45.00
P	45.00	71.50
Q	71.50	112.50
R	112.50	180.00
S	180.00	285.00
T	285.00	450.00
U	450.00	715.00
V	715.00	1125.00
W	1125.00	1800.00
X	1800.00	2850.00
Y	2850.00	4500.00

Tolerance:  $\pm 15\%$

### Color Binnings

Package	Color Bin	Wavelength (nm)	
		Min.	Max.
GaN/InGaN Blue	A	460.0	465.0
	B	465.0	470.0
	C	470.0	475.0
	D	475.0	480.0
InGaN Green	A	515.0	520.0
	B	520.0	525.0
	C	525.0	530.0
	D	530.0	535.0
Orange	A	597.0	600.0
	B	600.0	603.0
	C	603.0	606.0
	D	606.0	609.0
	E	609.0	612.0
	F	612.0	615.0
Red	Full Distribution		
AlGaAs Red	Full Distribution		

Tolerance:  $\pm 1.0$  nm

Package	Color Bin	Wavelength (nm)	
		Min.	Max.
Green	A	561.5	564.5
	B	564.5	567.5
	C	567.5	570.5
	D	570.5	573.5
	E	573.5	576.5
Yellow	A	582.0	584.5
	B	584.5	587.0
	C	587.0	589.5
	D	589.5	592.0
	E	592.0	594.5
	F	594.5	597.0
Amber	A	582.0	584.5
	B	584.5	587.0
	C	587.0	589.5
	D	589.5	592.0
	E	592.0	594.5
	F	594.5	597.0

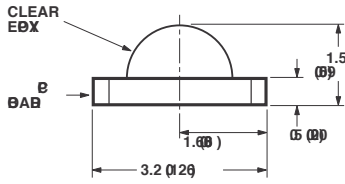
Tolerance:  $\pm 0.5$  nm



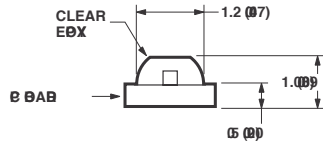
# LED Indicators and Displays

## Surface Mount ChipLEDs

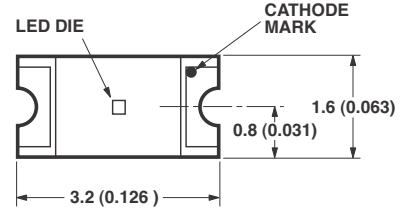
### Package Dimensions



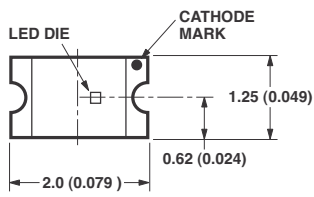
HSMx-C110



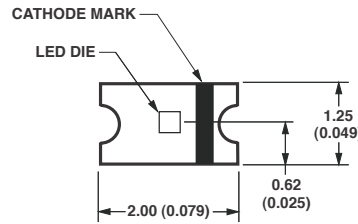
HSMx-C120



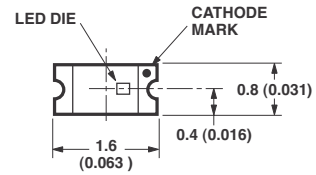
HSMx-C150



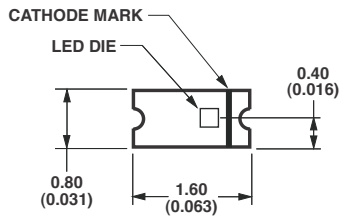
HSMx-C170



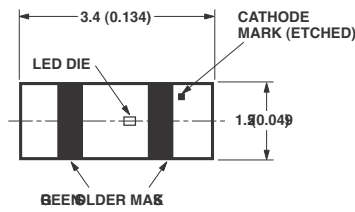
HSMx-C177



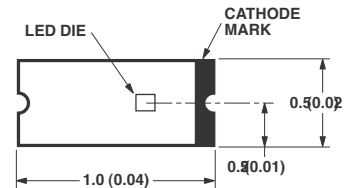
HSMx-C190/C191



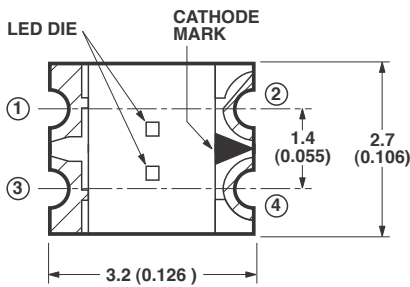
HSMx-C197



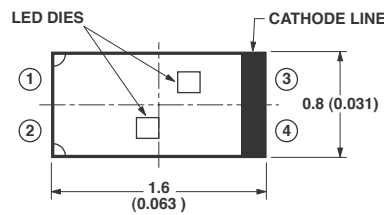
HSMx-C265



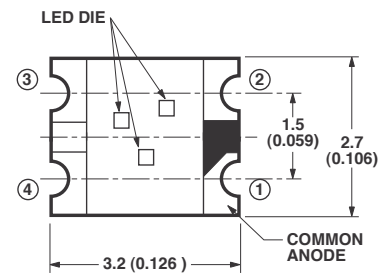
HSMx-C280



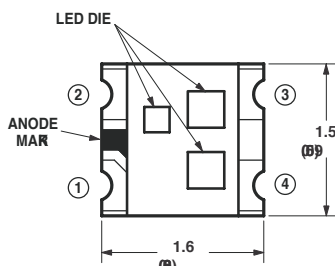
HSMF-C15x



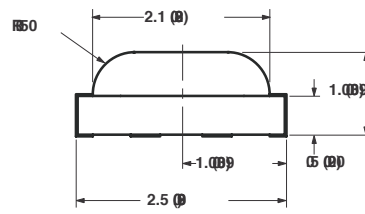
HSMF-C16x



HSMF-C118



HSMF-C114



HSMF-C113/C115

Dimensions are in millimeters (Inches).  
Tolerance is  $\pm 0.1$  mm ( $\pm 0.004$  in.)  
unless otherwise specified.

# LED Indicators and Displays

## Auto Focus Auxiliary Flash LED



### Description

Avago ASMT-FJ10 and ASMT-FG10 are SMT (Surface Mount Technology) dome lamps. They use an untinted, non-diffused lens to provide a high luminous intensity within a narrow radiation pattern. These devices are made by encapsulating LED chips onto axial lead frames to form molded epoxy lamp packages with six bended leads for surfacing mounting.

The colors available for the SMT Lamp package is 530nm Green and 605nm Orange.

This narrow angle SMT lamp package is designed for applications which require long distance illumination and narrow beam pattern such as auxiliary flash for auto-focus function in digital still camera.

This package is compatible with the Pb-free 2x reflow soldering process.

### Eye safety classification

The Orange and Green surface mount AF lamps are used for camera applications. The Orange LED is safe to operate under all driving conditions up to 50mA; however the Green LED is limited by the current.

The LED lenses focus the divergent beam of light 10mm from the front of the lens, If no collimating optics are added to the optical path, the Orange LEDs placed in a product, would create a Class 1 LED to IEC/EN 60825-1 (2001) under all conditions of operation and single fault failure.

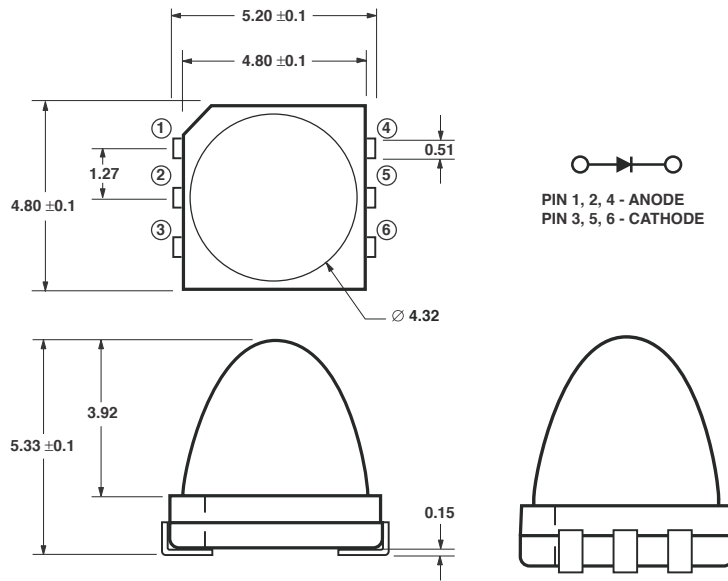
The Green LED is tested as Class 1 to IEC/EN 60825-1 (2001) under operation at 20mA. This LED is not recommended to drive beyond 20mA as part may fall in the classification of Class 2M to IEC/EN 60825-1 (2001).

### Features and Benefits

- Smooth, consistent narrow radiation pattern
- Optimized viewing angle vs. illumination distance
- Viewing angle optimized for auto focus function, while not affecting the illumination distance required by digital still cameras (>3m)
- 8° viewing angle for Orange, 6° viewing angle for Green.
- Small footprint with 4.8L x 4.8W x 5.33H mm package dimension
- Well-fitted into compact digital still camera and mobile phone designs
- Allows easy assembly and PCB space saving.
- Low power consumption with good intensity output, typical 22cd for Orange and 40cd for Green at 20mA.
- Up to 3m illumination
- Compatible with reflow soldering
- IEC/EN 60825-1 Eye Safety Class 1
- 4.8 L x 4.8 W X 5.33H mm package dimension
- RoHS compliant

# LED Indicators and Displays

## Auto Focus Auxiliary Flash LED Package Dimensions



NOTES:  
1. ALL DIMENSIONS IN MILLIMETERS.  
2. TOLERANCE IS  $\pm 0.1$ mm UNLESS OTHERWISE SPECIFIED.

Part Number	Color	Dominant Wavelength (nm)	Viewing Angle	Lens	Intensity			Vf Typ. (V)	Test Current (mA)
					Min. (cd)	Typ. (cd)	Max. I <sub>v</sub> (cd)		
ASMT-FJ10-ADH00	AllInGaP Orange	605	8°	Clear	9	18	–	2	20
ASMT-FJ10-NFJ00	InGaN Green	530	6°	Clear	18	40	56	2	20

### Iv Bin Category (cd)

Orange	Min.	Max.
A	600	604
B	604	608
C	608	612

Green	Min.	Max.
D	9.0	11.5
E	11.5	15.0
F	15.0	19.5
G	19.5	25.5
H	25.5	33.0
I	33.0	43.0
J	43.0	56.0

Iv Tolerance =  $\pm 15\%$

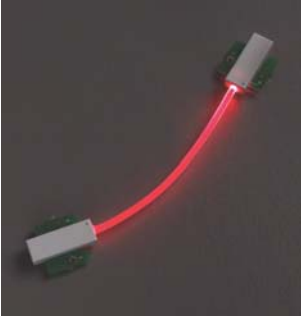
### Color Bin Category

Orange	Min. (nm)	Max. (nm)
A	600	604
B	604	608
C	608	612
Green	Min. (nm)	Max. (nm)
A	515.0	520.0
B	520.0	525.0
C	525.0	530.0
D	530.0	535.0

Tolerance =  $\pm 1$ nm

## LED Indicators and Displays

### Flexible Light Strip Module



#### Description

The Flexible Light Strip Module is a high-performance light tube integrating LEDs solution with excellent thermoplastic polyurethane. This Light Strip is an environmentally friendly “Green Material.” It offers a unique combination of mechanical, physical, and chemical properties, including high-tensile strength, excellent abrasion resistance, outstanding flexibility, weather resistance, non-toxic, recyclable, and decomposable. The Flexible Light Strip Module provides conveniences for the designers to integrate a light strip onto their devices with minimum consideration on optical and mechanical optimization. The specially designed housing helps to concentrate the light for maximum efficiency and the specially designed PCB provides a plug-and-play type of solution for assembly. The total solution provides the ease of design and assembly for designers.

#### Features and Benefits

- Outstanding abrasion resistance
- Excellent mechanical properties
- Excellent chemical resistance
- Excellent light transitivity
- High shaping flexibility
- Available length: 100 mm to 500 mm with 1 mm interval
- Available voltage source : 5 V, 9 V and 12 V
- Available colors: Blue, Green, Red and White

#### Typical Applications

- Handheld devices
- Cellular phones
- Decorative lighting
- Electronics and electrical appliances

# LED Indicators and Displays

## Flexible Light Strip Module Selection Guide

Part Number	Color	Available Vcc	Housing	Length	Diameter
ASMT-LR50	Red	5, 9, 12 V	Single	226 mm	1.4 mm
ASMT-LG50	Green	5, 9, 12 V	Single	226 mm	1.4 mm
ASMT-LB50	Blue	5, 9, 12 V	Single	226 mm	1.4 mm
ASMT-LW50	White	5, 9, 12 V	Single	226 mm	1.4 mm
ASMT-LR60	Red	5, 9, 12 V	Double	200 mm	1.4 mm
ASMT-LG60	Green	5, 9, 12 V	Double	200 mm	1.4 mm
ASMT-LB60	Blue	5, 9, 12 V	Double	200 mm	1.4 mm
ASMT-LW60	White	5, 9, 12 V	Double	200 mm	1.4 mm

### Notes:

1. Length option available from 100 mm to 500 mm with the interval of 1 mm
2. Diameter option available 1 mm and 1.4 mm

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

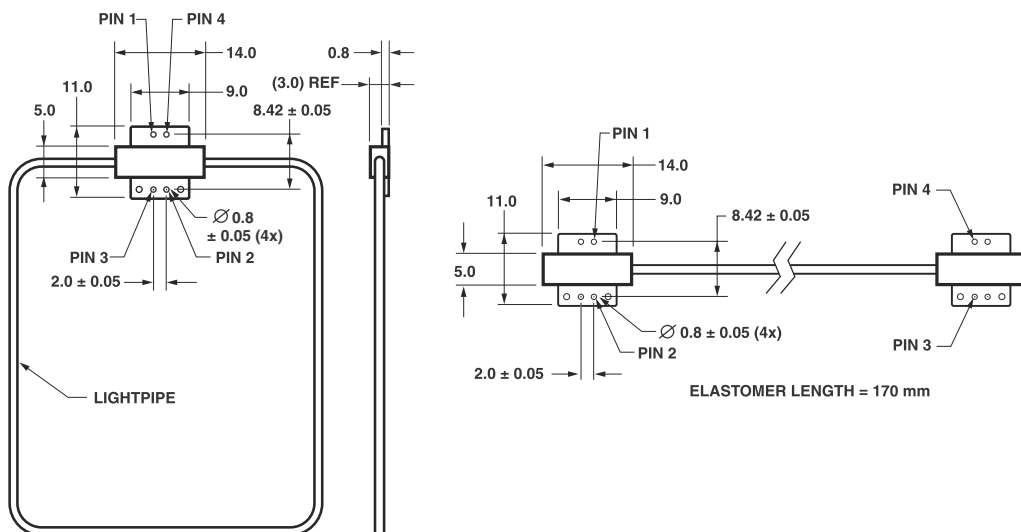
Part Number	Luminous Intensity, $I_v^{[1][2]}$ (mcd) @ 20mA		Peak Wavelength, $\lambda_{\text{peak}}^{[1]}$ (nm)	Dominant Wavelength $\lambda_d^{[1][3]}$ (nm)		Luminous Incidence $E_v^{[5]}$ (lm/m <sup>2</sup> )
	Min.	Max.	Typ.	Min.	Max.	Typ.
ASMT-LB50/60	71.5	180.0	468	465	475	30.0
ASMT-LG50/60	180.0	450.0	520.0	515.0	535.0	130.0
ASMT-LR50/60	112.5	285.0	637.0	615.0	630.0	30.0

Part Number	Luminous Intensity, $I_v^{[1][2]}$ (mcd) @ 20mA		Typical Chromaticity Coordinates $x^{[1][4]}$		Luminous Incidence $E_v^{[5]}$ (lm/m <sup>2</sup> )
	Min.	Max.	X	Y	Typ.
ASMT-LW50/60	1000	1600	0.31	0.31	230.0

### Notes:

1. For individual LED light source only.
2. The luminous intensity  $I_v$  is measured at the peak of the spatial radiation pattern which may not be aligned with the mechanical axis of the LED package. Refer to  $I_v$  bin table for binning structure and tolerance.
3. The dominant wavelength,  $\lambda_d$ , is derived from the CIE 1931 Chromaticity Diagram and represents the perceived color of the device. Refer to color bin limit tables for binning structure and tolerance.
4. The chromaticity coordinates are derived from the CIE 1931 Chromaticity Diagram and represent the perceived color of the device. Refer to color bin limit tables for binning structure and tolerance.
5. Measurement done at the center of the elastomer light stripe away from the LED light sources.

### Package Dimensions



# LED Indicators and Displays



## Standard Through-hole Lamps

### Description

Avago Technologies offers three types of technology-based LEDs. GaP-based technologies are suitable for low to moderate light output requirements. AllInGaP and InGaN product offering are suitable for high brightness needs. Through-hole LEDs are offered in a variety of packages such as 3 mm, 4 mm, 5 mm, rectangular, bicolor, integrated resistors in standard and low current options.

These devices are molded from advanced optical grade epoxy, which provide superior high temperature performance and excellent moisture resistance.

Through-hole LEDs are suitable for all applications requiring backlighting and status indication. Consumer electronics and automotive interiors use LEDs to add value to their products. Low power consumption, high reliability and a broad range of colors and packages are just a few reasons why.

### Features and Benefits

- Excellent product quality and reliability
- Wide range of products
- Competitive pricing
- Wide operating temperature range
  - With minor electrical/optical changes
- Lower power consumption
  - High efficiency, low drive currents and low driving voltages required
- High reliability
  - No replacement for life of equipment
- High reliability for AllInGaP lamps compared to TS AlGaAs at equivalent pricing and high brightness
  - No replacement for life of equipment with 100 or 1000 hours projected life
- Thin, light weight and robust packaging
  - Excellent performance even under vibration and mechanical shock
- Different material technologies available in standard GaP LED lamps
  - Choice of colors (560 nm – 626 nm): Green, Yellow, Amber, Orange and Red
- Five colors available with high luminous intensity in AllInGaP LED lamps
  - Amber (590 nm), Red (626 nm), deep Red (635 nm), Orange (605 nm) and Red-Orange (615 nm)
- Four colors available with high luminous intensity in InGaN LED lamps
  - Blue (470 nm), Green (527 nm), Bluish Green (500 nm) and White
- Several packaging options
  - Different sizes with a clear or diffused lens, several lead configurations and different spatial radiation patterns available in bulk, ammo-pack, right angle housing and tape and reel

### Typical Applications

- Consumer
  - ovens, washers, etc.
  - audio, hi-fi and electrical appliances
  - gaming and vending machines
  - electronic toys and games
- Industrial
  - sensors
  - instruments
  - measurement equipment
- Automotive and Other
  - automotive interior
  - exercise equipment
  - medical equipment
  - front panel industrial equipment

# LED Indicators and Displays

## Standard Through-hole LED Lamps

Part Number	Color	Dominant Wavelength (nm)	Viewing Angle	Lens	Intensity		Vf Typ. (V)	Test Current (mA)	2 Intensity Bin Selection
					Min. (mcd)	Typ. (mcd)			
<b>3 mm (T1) LED Lamps — Standard Current</b>									
HLMP-1301-G0002	GaP Red	626	60°	Tinted, Diffused	8.6	11	1.9	10	n/a
HLMP-1321	GaP Red	626	45°	Tinted, Non-diffused	8.6	30	1.9	10	n/a
HLMP-1340	GaP Red	626	45°	Micro-tinted, Non-diffused	8.6	30	1.9	20	n/a
HLMP-1401-E0000	GaP Yellow	585	60°	Tinted, Diffused	3.6	6	2	10	E, F
HLMP-1440	GaP Yellow	585	45°	Micro-tinted, Non-diffused	23.5	45	2.1	20	H, I
HLMP-1503	GaP Green	569	60°	Tinted, Diffused	4.2	8.5	2	10	D, E
HLMP-1521	GaP Green	569	45°	Tinted, Non-diffused	6.7	22	2.1	10	n/a
HLMP-1540	GaP Green	569	45°	Untinted, Non-diffused	27.3	45	2.2	20	I, J
HLMP-K101	AlGaAs Red	637	60°	Tinted, Diffused	22	45	1.8	20	n/a
HLMP-K105	AlGaAs Red	637	45°	Untinted, Non-diffused	35.2	65	1.8	20	n/a
HLMP-K640	GaP Green	560	45°	Untinted, Non-diffused	4.2	21	2.2	20	n/a
HLMP-KB45-A0000	GaN Blue	462	40°	Untinted, Non-diffused	30	45	4	20	n/a
<b>3 mm (T1) LED Lamps — Autoinsertable</b>									
HLMP-NG05	AllnGaP Red	626	45°	Micro-tinted, Non-diffused	90.2	—	1.90	20	n/a
HLMP-NG07	AllnGaP Red	626	60°	Micro-tinted, Non-diffused	90.2	—	1.90	20	n/a
HLMP-NL06	AllnGaP Amber	590	60°	Micro-tinted, Non-diffused	90.2	—	2.02	20	n/a
HLMP-NS30	InGaN Blue	470	30°	Untinted, Non-diffused	240	550	3.6	20	n/a
<b>3 mm (T1) 5V, 12V Integrated Resistor LED Lamps</b>									
HLMP-1621 <sup>[1]</sup>	GaP Yellow	585	60°	Tinted, Diffused	2.2	8	8	—	n/a
HLMP-1640-B00A2 <sup>[2]</sup>	GaP Green	589	60°	Tinted, Diffused	1.6	8	8	—	n/a
<b>5 mm (T1 3/4) LED Lamps — Standard Current</b>									
HLMP-3301	GaP Red	626	60°	Tinted, Diffused	5.4	7	1.9	10	F, G
HLMP-3401	GaP Yellow	585	60°	Tinted, Diffused	5.7	8	2	10	E, F
HLMP-3507	GaP Green	569	60°	Tinted, Diffused	4.2	5.2	2.1	10	E, F
HLMP-3950	GaP Green	569	24°	Micro-tinted, Non-diffused	111.7	265	2.2	20	n/a
HLMP-C008-U0000	AllnGaP Red	626	8°	Untinted, Non-diffused	2900	6000	1.9	20	n/a
HLMP-C025-P0000	AllnGaP Red	626	25°	Untinted, Non-diffused	500	1000	1.9	20	n/a
HLMP-C208-S0000	AllnGaP Amber	590	8°	Untinted, Non-diffused	2600	3000	1.9	20	n/a
HLMP-C225-O0000	AllnGaP Amber	590	25°	Untinted, Non-diffused	450	800	1.9	20	n/a
HLMP-C608-R0000	AllnGaP Red	635	8°	Untinted, Non-diffused	1000	2000	1.9	20	n/a
HLMP-C625-P0000	AllnGaP Red	635	25°	Untinted, Non-diffused	500	700	1.9	20	n/a
HLMP-DB25-B0000	GaN Blue	462	25°	Untinted, Non-diffused	40	100	4	20	n/a
HLMP-DM25-J0000	InGaN Green	527	25°	Untinted, Non-diffused	240	970	3.8	20	n/a
HLMP-DS25-F0000	InGaN Blue	470	25°	Untinted, Non-diffused	110	260	3.6	20	n/a
<b>5 mm (T1 3/4) LED Lamps — Low Current</b>									
HLMP-4700	GaP Red	626	50°	Tinted, Diffused	1.3	2.3	1.8	2	n/a
HLMP-4719	GaP Yellow	585	50°	Tinted, Diffused	0.9	2.1	1.9	2	n/a
HLMP-4740	GaP Green	569	50°	Tinted, Diffused	1	2.3	1.8	2	n/a
HLMP-D150	AlGaAs Red	637	65°	Tinted, Diffused	1.3	3	1.6	1	n/a

Notes: 1. Operating Voltage = 12V. 2. Operating Voltage = 5V.

# LED Indicators and Displays

## Standard Through-hole Lamps

Part Number	Color	Dominant Wavelength (nm)	Viewing Angle	Lens	Intensity		Vf Typ. (V)	Test Current (mA)	2 Intensity Bin Selection
					Min. (mcd)	Typ. (mcd)			
<b>2 mm x 5 mm Rectangular LED Lamps</b>									
HLMP-S201	GaP Red	626	110°	Tinted, Diffused	3.4	7.5	1.9	20	n/a
HLMP-S301	GaP Yellow	585	110°	Tinted, Diffused	2.2	4	2.1	20	n/a
HLMP-S501	GaP Green	569	110°	Tinted, Diffused	4.2	8	2.2	20	n/a
<b>5 mm (T1 3/4) LED Lamps — Bicolor</b>									
HLMP-4000	GaP Green	570	65	Untinted, Diffused	4.2	–	2.2	10	n/a
	GaP Red	626	65	Untinted, Diffused	2.1	–	1.9	10	n/a
HLMP-4015	GaP Green	570	65	Untinted, Non-Diffused	20	–	2.2	20	n/a
	GaP Yellow	585	65	Untinted, Non-Diffused	20	–	2.6	20	n/a

## Through-hole LEDs

### Standard Intensity Categories (approx. 2:1 bins)

Bin ID	Iv in mcd		Color Bin	Wavelength (nm)	
	Min.	Max.		Min.	Max.
<b>Yellow/Amber</b>					
A	1.0	1.6	1	582	584.5
B	1.6	2.5	3	584.5	587
C	2.5	4.0	2	587	589.5
D	4.0	6.5	4	589.5	592
E	6.5	10.3	5	592	593.0
F	10.3	16.6	<b>Amber</b>		
G	16.6	26.5	3	584.5	587
H	26.5	42.3	2	587	589.5
I	42.3	67.7	4	589.5	592
J	67.7	108.2	6	592	594.5
K	108.2	173.2	7	594.5	597
L	173.2	250			
M	250	360			
N	360	510			
O	510	800			
P	800	1250			
Q	1250	1800			
R	1800	2900			
S	2900	4700			
T	4700	7200			
U	7200	11700			
V	11700	18000			
W	18000	27000			

Maximum Tolerance for each bin limit is +/- 18%

Maximum Tolerance for each color bin limit is +/- 0.5 nm

Bin ID	Iv in mcd	
	Min.	Max.
<b>Red/Orange</b>		
A	0.6	0.9
B	0.9	1.5
C	1.5	2.4
D	2.4	3.8
E	3.8	6.1
F	6.1	9.7
G	9.7	15.5
H	15.5	24.8
I	24.8	39.6
J	39.6	63.4
K	63.4	101.5
L	101.5	162.4
M	162.4	234.6
N	234.6	340.0
O	340	540
P	540	850
Q	850	1200
R	1200	1700
S	1700	2400
T	2400	3400
U	3400	4900
V	4900	7100
W	8100	10200
X	10200	14800
Y	14800	21400
Z	21400	30900

Maximum Tolerance for each bin limit is +/- 18%

Maximum Tolerance for each color bin limit is +/- 0.5 nm



# LED Indicators and Displays

## Standard Through-hole Lamps

### Through-hole LEDs

#### Standard Intensity Categories (approx. 2:1 bins)

Colors: Blue (InGaN/GaN)   
InGaN Green 

Bin ID	Iv in mcd	
	Min.	Max.
A	30.0	40.0
B	40.0	50.0
C	50.0	65.0
D	65.0	85.0
E	85.0	110.0
F	110.0	140.0
G	140.0	180.0
H	180.0	240.0
J	240.0	310.0
K	310.0	400.0
L	400.0	520.0
M	520.0	680.0
N	680.0	880.0
P	880.0	1150.0
Q	1150.0	1500.0
R	1500.0	1900.0
S	1900.0	2500.0
T	2500.0	3200.0
U	3200.0	4200.0
V	4200.0	5500.0
W	5500.0	7200.0
X	7200.0	9300.0
Y	9300.0	12000.0
Z	12000.0	16000.0
1	16000.0	21000.0
2	21000.0	27000.0
3	27000.0	35000.0
4	35000.0	45000.0
5	45000.0	59000.0

Tolerance for each bin limit is  $\pm 15\%$ .

Bin ID Color Green/ Emerald Green	Wavelength (nm)	
	Min.	Max.
A	1.1	1.8
B	1.8	2.9
C	2.9	4.7
D	4.7	7.6
E	7.6	12.0
F	12.0	19.1
G	19.1	30.7
H	30.7	49.1
I	49.1	78.5
J	78.5	125.7
K	125.7	201.1
L	201.1	289
M	289	417
N	417	680
O	680	1100
P	1100	1800
Q	1800	2700
R	2700	4300
S	4300	6800
T	6800	10800
U	10800	16000
V	16000	25000
W	25000	40000

Maximum Tolerance for each bin limit is  $\pm 18\%$

Maximum Tolerance for each color bin limit is  $\pm 0.5$  nm

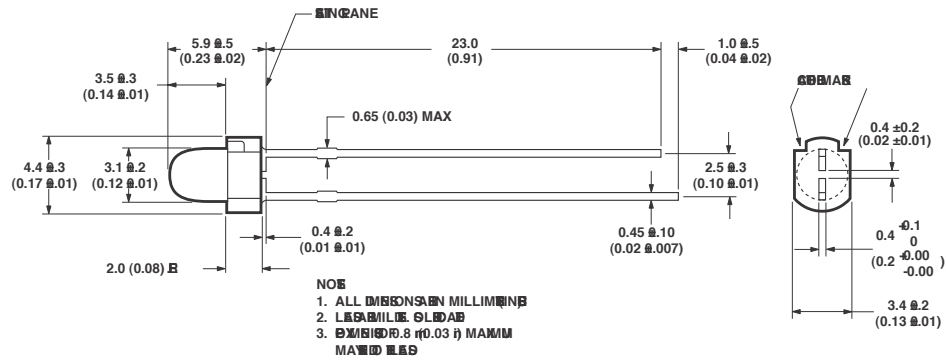
Color Bin Green Color	Wavelength (nm)	
	Min.	Max.
9	552.5	555.5
8	555.5	558.5
7	558.5	561.5
6	561.5	564.5
5	564.5	567.5
4	567.5	570.5
3	570.5	573.5
2	573.5	576.5

Color Bin Blue Color	Wavelength (nm)	
	Min.	Max.
1	460.0	464.0
2	464.0	468.0
3	468.0	472.0
4	472.0	476.0
5	476.0	480.0
6	480.0	484.0
Green Color		
1	520.0	530.0
2	530.0	540.0
3	520.0	525.0
4	525.0	530.0
5	530.0	535.0
6	535.0	540.0

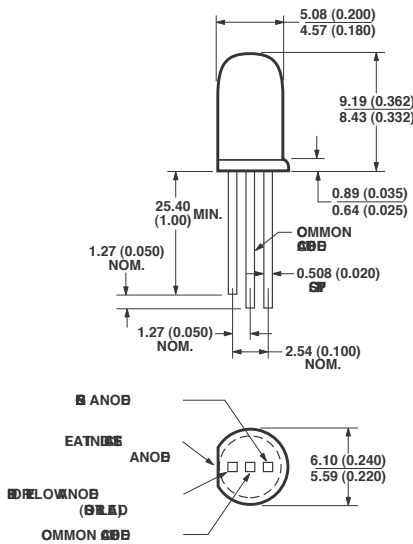
Tolerance for each bin limit is  $\pm 2\%$ .

# LED Indicators and Displays

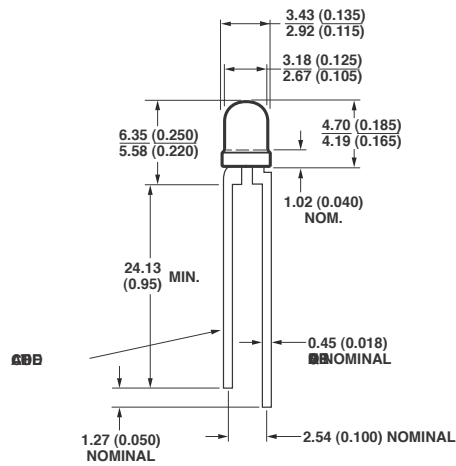
## 3 mm (T1) LED Lamps – Autoinsertable Package



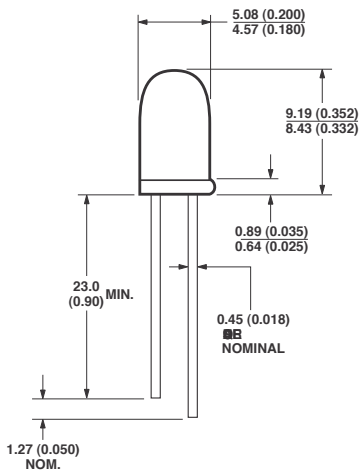
## 5 mm (T1-3/4) LED Lamps - Bicolor



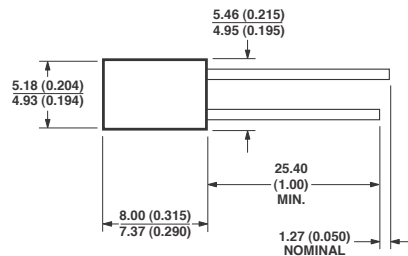
## 3 mm (T1) LED Lamps Package



## 5 mm (T1 3/4) LED Lamps Package



## 2 x 5 mm Rectangular LED Lamps Package



# LED Indicators and Displays

## Subminiature Lamps



### Description

Avago Technologies' Subminiature Lamps are designed for modern printed circuit (PC) boards, replacing through-hole mounted components for many traditional functions with smaller components, sized for closer placement.

Subminiature Lamp components are available in several lead configurations that can be used for top mount or reverse mount, and through-hole applications. The lead configurations are 'Gull Wing'–011 option, 'Yoke Bend'–021 option and 'Z Bend'–031 option. A variety of packages are available, such as flat top, dome and rectangular in standard or low current options.

### Features and Benefits

- Excellent product quality
- Wide range of product offering
- Competitive pricing
- Can be used with surface mount or through-hole applications
- High reliability
  - No replacement for life of equipment
- Wide operating temperature range
  - Minor electrical/optical changes
- Lower power consumption
  - High efficiency, low drive currents required, low driving voltages
- Thin, light-weight and robust packaging
  - Excellent performance even under vibration and mechanical shock
- Different thin material technologies available
  - Several colors available in GaP
  - Choice of colors (560 – 626 nm): Green, Yellow, Amber, Orange, Red and Deep Red
  - Three colors available in AlInGaP
    - Amber (590 nm), Red (626 nm) and Orange (605 nm)
  - Two colors available in InGaN
    - Blue (472 nm), Green (526 nm)
- Several lead configuration options
  - Gull-wing, Yoke-bend and Z-bend
- Several Packaging options
  - Different sizes and spatial radiation patterns available in bulk, right angle housing, and tape and reel

### Typical Applications

- Industrial and Communication
  - Front panel and symbol indicator
  - Keypad and push button backlighting
- Consumer
  - CD player, hi-fi audio and electrical appliances
  - Keypad and push button backlighting
- Automotive
  - Dashboard panel and symbol backlighting
  - Car radio indicators

# LED Indicators and Displays

## Domed Subminiature Lamps

Part Number	Color	Dominant Wavelength (nm)	Viewing Angle	Lens	Intensity		Vf Typ. (V)	Test Current (mA)
					Min. (mcd)	Typ. (mcd)		
HLMP-Q106-R00xx	TS AlGaAs Red	644	15°	Untinted, Non-diffused	100	530	1.9	20
HLMA-QG00-S00xx	AllnGaP Red	626	15°	Untinted, Non-diffused	160	500	1.9	20
HLMT-QG00	AllnGaP Red	626	15°	Untinted, Non-diffused	–	800	2	20
HLMP-6300-F00xx	GaP Red	626	90°	Tinted, Diffused	1	10	1.8	10
HLMA-QH00-S00xx	AllnGaP Red-Orange	615	15°	Untinted, Non-diffused	160	500	1.9	20
HLMT-QH00-T00xx	AllnGaP Red-Orange	615	15°	Untinted, Non-diffused	250	800	2	20
HLMA-QJ00	AllnGaP Orange	605	15°	Untinted, Non-diffused	–	500	1.9	20
HLMA-QL00-S00xx	AllnGaP Amber	590	15°	Untinted, Non-diffused	160	500	1.9	20
HLMT-QL00-T00xx	AllnGaP Amber	590	15°	Untinted, Non-diffused	250	1000	2	20
HLMP-6400-F00xx	GaP Yellow	585	90°	Tinted, Diffused	1	9	2	10
HLMP-6500-F00xx	GaP Green	569	90°	Tinted, Diffused	1	7	2.1	10
HLMP-6505-L00xx	GaP Green	569	28°	Untinted, Non-diffused	10	20	2.1	10
HLMP-Q600-F00xx	GaP Emerald Green	560	90°	Tinted, Diffused	1	1.5	2.2	10
HLMP-QB00	InGaN Blue	472	20°	Untinted, Non-diffused	–	400	3.5	20
HLMP-QM00	InGaN Green	526	20°	Untinted, Non-diffused	–	2000	3.5	20
Domed Subminiature Lamps — Low Current								
HLMP-Q150-F00xx	AlGaAs Red	637	90°	Tinted, Diffused	1	1.8	1.8	1
HLMP-7000-D00xx	GaP Red	626	90°	Tinted, Diffused	0.4	1	1.4	2
HLMP-7019-D00xx	GaP Yellow	585	90°	Tinted, Diffused	0.4	0.6	1.6	2
HLMP-7040-D00xx	GaP Green	569	90°	Tinted, Diffused	0.4	0.6	1.4	2

## Domed Subminiature Lamps — Resistor

Part Number	Color	Dominant Wavelength (nm)	Viewing Angle	Lens	Intensity		Vf Typ. (V)	Test Current (mA)
					Min. (mcd)	Typ. (mcd)		
HLMP-6600-G00xx	GaP Red	626	90°	Tinted, Diffused	1.6	5	9.6	5
HLMP-6620-F00xx	GaP Red	626	90°	Tinted, Diffused	1	2	3.5	5
HLMP-6700-G00xx	GaP Yellow	585	90°	Tinted, Diffused	1.6	5	9.6	5
HLMP-6720-F00xx	GaP Yellow	585	90°	Tinted, Diffused	1	2	3.5	5
HLMP-6800-G00xx	GaP Green	569	90°	Tinted, Diffused	1.6	5	9.6	5
HLMP-6820-F00xx	GaP Green	569	90°	Tinted, Diffused	1	2	3.5	5
Flat Top Subminiature Lamps								
HLMP-P105-L00xx	AlGaAs Red	637	125°	Untinted, Non-diffused	10	30	1.8	20
HLMA-PG00-N00xx	AllnGaP Red	626	125°	Untinted, Non-diffused	25	75	1.9	20
HLMT-PG00	AllnGaP Red	626	125°	Untinted, Non-diffused	–	150	2	20
HLMP-P205-F00xx	GaP Red	626	125°	Untinted, Non-diffused	1	8	1.8	10
HLMA-PH00-N00xx	AllnGaP Red-Orange	615	125°	Untinted, Non-diffused	25	75	1.9	20
HLMT-PH00-P00xx	AllnGaP Red Orange	615	125°	Untinted, Non-diffused	40	150	2	20
HLMA-PJ00	AllnGaP Orange	605	125°	Untinted, Non-diffused	–	75	2	20
HLMA-PL00-N00xx	AllnGaP Amber	590	125°	Untinted, Non-diffused	25	75	1.9	20
HLMT-PL00-POWxx	AllnGaP Amber	590	125°	Untinted, Non-diffused	40	150	2	20
HLMP-P505-G00xx	GaP Green	569	125°	Untinted, Non-diffused	1	5	2.1	10
HLMP-P605-F00xx	GaP Emerald Green	560	125°	Untinted, Non-diffused	1	1.5	2.2	10
HLMP-PB00	InGaN Blue	472	90°	Untinted, Non-diffused	–	80	3.5	20
HLMP-PM00	InGaN Green	526	90°	Untinted, Non-diffused	–	400	3.5	20

## LED Indicators and Displays

Subminiature Lamps are also available in the following options:

Mechanical Option Number	Description
10	Right Angle
11	Tape and Reel, 1500 lamps per reel
12	Gull Wing, Bulk Packaging
21	Yoke Lead, Tape and Reel, 1500 lamps per reel
22	Yoke Lead, Bulk Packaging
31	Z-Bend, Tape and Reel, 1500 lamps per reel
32	Z-Bend, Bulk Packaging

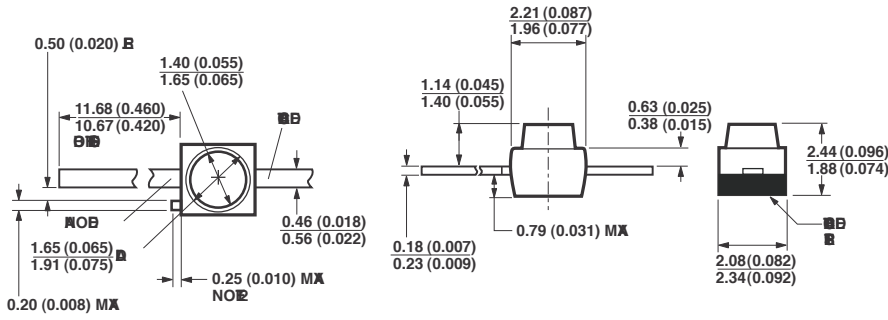
### Surface Mount Subminiature LED Lamps Standard Intensity Categories

Package Universal	Customer Iv in mcd		
	Bin	Min.	Max.
	A	0.1	0.2
	B	0.16	0.32
	C	0.25	0.5
	D	0.4	0.8
	E	0.63	1.25
	F	1	2
	G	1.6	3.2
	H	2.5	5
	J	4	8
	K	6.3	12.5
	L	10	20
	M	16	32
	N	25	50
	P	40	80
	Q	63	125
	R	100	200
	S	160	320
	T	250	500
	U	400	800
	V	630	1250
	W	1000	2000
	X	1600	3200
	Y	2500	5000

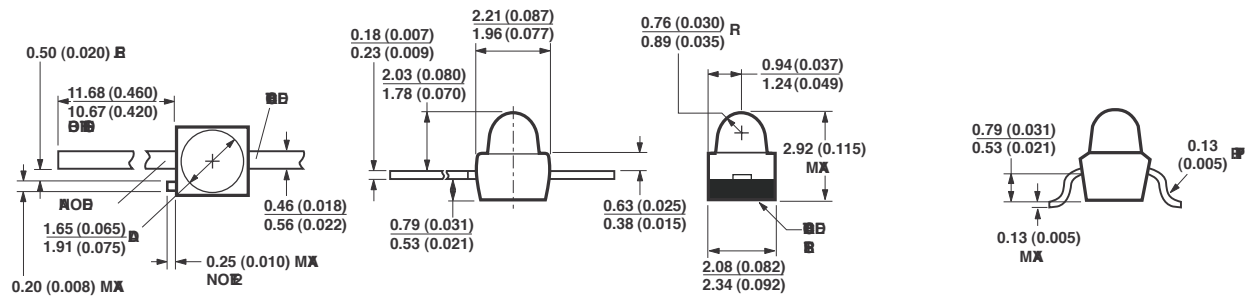
Package Universal	Color Bin	Wavelength (nm)	
		Min.	Max.
InGaN Blue	0	Full dist.	
	1	460	464
	2	464	468
	3	468	472
	4	472	476
	5	476	480
InGaN Green	6	480	484
	0	Full dist.	
	1	520	530
Emerald Green	2	530	540
	9	552	556
	8	555	559
	7	558	562
	6	561	565
Green	5	565	568
	4	567	571
	3	570	574
	2	573	577
Yellow	1	581.5	585
	3	584	587.5
	2	586.5	590
	4	589	592.5
	5	591.5	593.5
	6	591.5	595
Orange	7	594	597.5
	1	596.5	600
	2	599	602.5
	3	601.5	604
	4	603.8	608.2
	5	606.8	611.2
	6	609.8	614.2
	7	612.8	617.2
Red Orange	8	615.8	620.2
	1	617.5	625
	2	621	628.5
	3	624.5	632

# LED Indicators and Displays

## Surface Mount Subminiature LED Lamps Package Dimensions



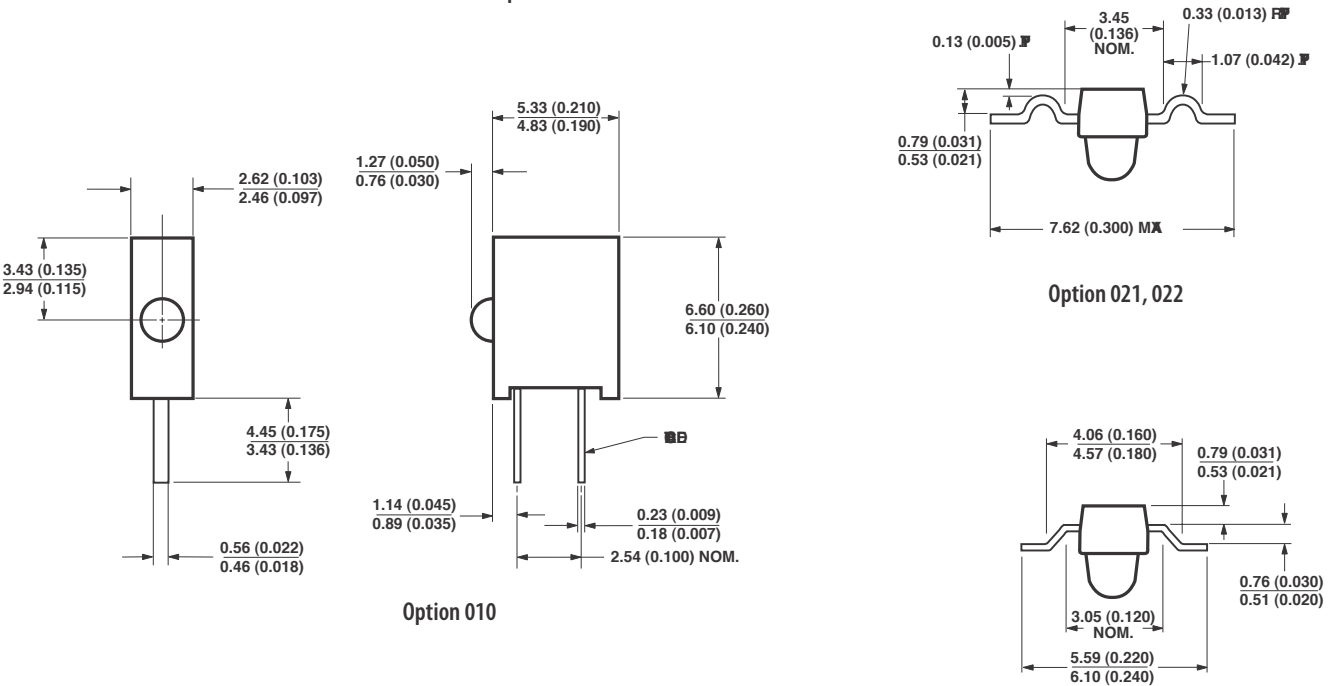
Flat Top Subminiature Lamps



Option 011, 012

- NOTE  
 1. LEAD FINISH  
 2. LEAD PLATING

## Domed Subminiature Lamps



Option 010

Option 021, 022

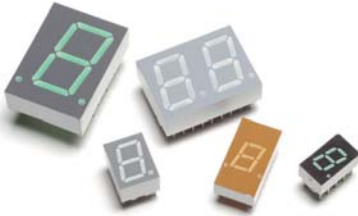
Option 031, 032

DIMENSIONS ARE IN MILLIMETERS (INCHES)

# LED Indicators and Displays

## Seven-Segment Displays

### Description



Avago Technologies offers a full range of seven-segment displays from low cost, standard brightness displays to high ambient light displays that produce up to 7.5 mcd per segment. Dual and single digit displays are available in assorted character heights and colors. They are divided into two platforms to address different market requirements in both industrial and consumer markets. Displays for industrial markets are designed for high-reliability applications and feature extremely durable packaging for high temperature environments. Consumer applications are designed for cost-sensitive, general-purpose display applications.

### Product Features and Benefits

- Semiconductor (LED) light source
  - Cost-effective solutions
  - Flexibility for designers
  - Light weight
- Lower power consumption
  - Electrical power savings
  - Low heat generation
  - Low current devices available
- Mechanically rugged
  - No wire filaments
  - No moving parts
  - Not sensitive to mechanical shock and vibration
- Essentially monochromatic light
  - No color filter required
  - Maximum use of visible light
- Easy for the eye to discern against distracting backgrounds in sunlight and adverse weather conditions
- High light output
- Industry standard size and pinout
- Categorized for luminous intensity (yellow and green categorized for color)

### Industrial Applications: High Performance Seven-segment Display Package

Industrial grade products provide high peak current, automated IV/color binning and the availability of intensity and color selection. Ideal for high reliability applications such as temperature controllers, this package is extremely durable in high temperature environments with better heat dissipation through a mild steel leadframe.

### Key benefits for the leadframe platform

- Heat dissipation from the package is faster than other PCB display products
- Brightness (Iv) degradation reduced over time
- Lead stability and consistency
- Solder coated leads result in better solderability
- Typical epoxy Tg is 140°C resulting in improved temperature cycling reliability

### Consumer Applications: Standard Seven-segment Display Package

Designed for the cost-competitive general purpose commercial LED display applications, this package is built with a PCB substrate using ultrasonic stitch-to-stitch bonding with aluminum wire.

### Key benefits for the PCB platform

- Competitive prices
- Avago Technologies quality, reliability and technical support
- Typical epoxy Tg is 100–120°C, suitable for applications that do not experience extreme temperatures and temperature cycling

Avago Technologies is committed to support the market by offering display performance and features that are specific to the designer's application requirements.

### Typical Industrial Applications












- High Performance Seven-segment Displays:
- Temperature controllers
  - Test and measurement instrumentation
  - Power converters
  - Home appliance displays
  - Automotive and avionic instrumentation
  - Fuel pump displays
  - Digital panel meters

### Typical Consumer Applications

- Standard Seven-segment Displays:
- Cable set-top boxes
  - Electronics displays
  - Gaming machines
  - Point of sale terminals
  - Answering machines
  - Exercise equipment

# LED Indicators and Displays









## Standard Seven-Segment Displays

Part Number	Face Color	Pin Configuration	Intensity ( $\mu\text{cd}$ )		I <sub>v</sub> Test Current (mA)	V <sub>f</sub> Typ. (V)	V <sub>f</sub> Test Current (mA)	Decimal
			Min.	Typ.				
<b>14.2 mm (0.56") Single Digit Displays</b>								
<b>Blue 466 nm</b> 								
HDSP-501B	Grey	Common Anode	2020	3400	10	3.8	20	Right
HDSP-503B	Grey	Common Cathode	2020	3400	10	3.8	20	Right
<b>14.2 mm (0.56") Dual Digit Displays</b>								
<b>GaP Yellow 587 nm</b> 								
HDSP-521Y	Grey	Common Anode	680	1800	10	2.1	20	Right
HDSP-523Y	Grey	Common Cathode	680	1800	10	2.1	20	Right
<b>GaP Red 626 nm</b> 								
HDSP-521E	Grey	Common Anode	1010	2800	10	2.1	20	Right
HDSP-523E	Grey	Common Cathode	1010	2800	10	2.1	20	Right
<b>GaP Green 571 nm</b> 								
HDSP-521G	Grey	Common Anode	1010	2500	10	2.1	10	Right
HDSP-523G	Grey	Common Cathode	1010	2500	10	2.1	10	Right
<b>AlGaAs Red 643 nm</b> 								
HDSP-521A	Grey	Common Anode	3201	6500	10	1.85	20	Right
HDSP-523A	Grey	Common Cathode	3201	6500	10	1.85	20	Right
<b>20 mm (0.8") Single Digit Display</b>								
<b>GaP Red 626 nm</b> 								
HDSP-815E	Grey	Common Anode	2300	4800	20	2.1	20	Right
HDSP-816E	Grey	Common Cathode	2300	4800	20	2.1	20	Right
<b>GaP Green 571 nm</b> 								
HDSP-815G	Grey	Common Anode	1500	3300	20	2.1	20	Right
HDSP-816G	Grey	Common Cathode	1500	3300	20	2.1	20	Right
<b>10 mm (0.4") Slim Font Single Digit Display</b>								
<b>GaP Red 625 nm</b> 								
HDSP-301E	Grey	Common Anode	1251	2000	10	1.90	20	Right
HDSP-303E	Grey	Common Cathode	1251	2000	10	1.90	20	Right
<b>GaP Green 573 nm</b> 								
HDSP-301G	Grey	Common Anode	2001	3200	10	2.25	20	Right
HDSP-303G	Grey	Common Cathode	2001	3200	10	2.25	20	Right
<b>AlGaAs Red 643 nm</b> 								
HDSP-301A	Grey	Common Anode	320	505	1	1.80	20	Right
HDSP-303A	Grey	Common Cathode	320	505	1	1.80	20	Right
<b>GaP Yellow 590 nm</b> 								
HDSP-301Y	Grey	Common Anode	1251	2000	10	2.15	20	Right
HDSP-303Y	Grey	Common Cathode	1251	2000	10	2.15	20	Right



# LED Indicators and Displays

## Standard Seven-Segment Displays

Part Number	Face Color	Pin Configuration	Intensity ( $\mu\text{cd}$ )		Iv Test Current (mA)	Vf Typ. (V)	Vf Test Current (mA)	Decimal
			Min.	Typ.				
<b>13 mm (0.56") Slim Font Single Digit Display</b>								
<b>GaP Red 625 nm</b> 								
HDSP-561E	Grey	Common Anode	2001	3526	10	1.90	20	Right
HDSP-563E	Grey	Common Cathode	2001	3526	10	1.90	20	Right
<b>GaP Green 573 nm</b> 								
HDSP-561G	Grey	Common Anode	3201	5601	10	2.25	20	Right
HDSP-563G	Grey	Common Cathode	3201	5601	10	2.25	20	Right
<b>AlGaAs Red 643 nm</b> 								
HDSP-561A	Grey	Common Anode	1010	2800	10	2.1	20	Right
HDSP-563A	Grey	Common Cathode	1010	2800	10	2.1	20	Right
<b>GaP Yellow 590 nm</b> 								
HDSP-561Y	Grey	Common Anode	506	878	1	1.80	20	Right
HDSP-563Y	Grey	Common Cathode	506	878	1	1.80	20	Right
<b>7.62 mm (0.3") Single Digit Display</b>								
<b>GaP Red 620 nm</b> 								
HDSP-331E	Grey	Common Anode	800	1800	10	2.05	20	Right & Left
HDSP-333E	Grey	Common Cathode	800	1800	10	2.05	20	Right
HDSP-334E	Grey	Common Cathode	800	1800	10	2.05	20	Right
<b>GaP Green 573 nm</b> 								
HDSP-331G	Grey	Common Anode	800	2000	10	2.25	20	Right & Left
HDSP-333G	Grey	Common Cathode	800	2000	10	2.25	20	Right
HDSP-334G	Grey	Common Cathode	800	2000	10	2.25	20	Right
<b>AlGaAs Red 643 nm</b> 								
HDSP-331A	Grey	Common Anode	2001	4200	10	1.85	20	Right & Left
HDSP-333A	Grey	Common Cathode	2001	4200	10	1.85	20	Right
HDSP-334A	Grey	Common Cathode	2001	4200	10	1.85	20	Right
<b>GaP Yellow 590 nm</b> 								
HDSP-331Y	Grey	Common Anode	800	1500	10	2.15	20	Right & Left
HDSP-333Y	Grey	Common Cathode	800	1500	10	2.15	20	Right
HDSP-334Y	Grey	Common Cathode	800	1500	10	2.15	20	Right

# LED Indicators and Displays

## Standard Seven-Segment Displays

Part Number	Face Color	Pin Configuration	Intensity ( $\mu\text{cd}$ )		Iv Test Current (mA)	Vf Typ. (V)	Vf Test Current (mA)	Decimal
			Min.	Typ.				
<b>10.16 mm (0.4" S) Single Digit Display</b>								
<b>GaP Red 620 nm</b> 								
HDSP-311E	Grey	Common Anode	1250	3200	10	2.05	20	Right
HDSP-313E	Grey	Common Cathode	1250	3200	10	2.05	20	Right
<b>GaP Green 573 nm</b> 								
HDSP-311G	Grey	Common Anode	1250	3200	10	2.25	20	Right
HDSP-313G	Grey	Common Cathode	1250	3200	10	2.25	20	Right
<b>AlGaAs Red 643 nm</b> 								
HDSP-311A	Grey	Common Anode	3200	7500	10	1.85	20	Right
HDSP-313A	Grey	Common Cathode	3200	7500	10	1.85	20	Right
<b>GaP Yellow 590 nm</b> 								
HDSP-311Y	Grey	Common Anode	800	1500	10	2.15	20	Right
HDSP-313Y	Grey	Common Cathode	800	1500	10	2.15	20	Right
<b>10.16 mm (0.4" D) Dual Digit Display</b>								
<b>GaP Red 620 nm</b> 								
HDSP-G01E	Grey	Common Anode	1250	2600	10	2.05	20	–
HDSP-G03E	Grey	Common Cathode	1250	2600	10	2.05	20	–
<b>GaP Green 573 nm</b> 								
HDSP-G01G	Grey	Common Anode	1250	3200	10	2.25	20	–
HDSP-G03G	Grey	Common Cathode	1250	3200	10	2.25	20	–
<b>AlGaAs Red 643nm</b> 								
HDSP-G01A	Grey	Common Anode	3200	6500	10	1.85	20	–
HDSP-G03A	Grey	Common Cathode	3200	6500	10	1.85	20	–
<b>GaP Yellow 590 nm</b> 								
HDSP-G01Y	Grey	Common Anode	800	1500	10	2.15	20	–
HDSP-G03Y	Grey	Common Cathode	800	1500	10	2.15	20	–

# LED Indicators and Displays

## Standard Seven-Segment Displays

Part Number	Face Color	Pin Configuration	Intensity ( $\mu\text{cd}$ )		Iv Test Current (mA)	Vf Typ. (V)	Vf Test Current (mA)	Decimal
			Min.	Typ.				
<b>14.22 mm (0.56" S) Single Digit Display</b>								
<b>GaP Red 620 nm</b> <span style="color:red">■</span>								
HDSP-511E	Grey	Common Anode	2001	4100	10	2.05	20	Right
HDSP-513E	Grey	Common Cathode	2001	4100	10	2.05	20	Right
<b>GaP Green 573 nm</b> <span style="color:green">■</span>								
HDSP-511G	Grey	Common Anode	2001	4100	10	2.25	20	Right
HDSP-513G	Grey	Common Cathode	2001	4100	10	2.25	20	Right
<b>AlGaAs Red 643 nm</b> <span style="color:red">■</span>								
HDSP-511A	Grey	Common Anode	3201	6500	10	1.85	20	Right
HDSP-513A	Grey	Common Cathode	3201	6500	10	1.85	20	Right
<b>GaP Yellow 590 nm</b> <span style="color:yellow">■</span>								
HDSP-511Y	Grey	Common Anode	1251	2600	10	2.15	20	Right
HDSP-513Y	Grey	Common Cathode	1251	2600	10	2.15	20	Right

## LED Standard Displays — Seven-Segment Displays Luminous Intensity Categories (Typ.)

### 0.56" Single Digit

Bin ID	Customer Iv in mcd	
	Min.	Max.
<b>Blue</b> <span style="color:blue">■</span> HDSP-50xB		
H	2.02	2.63
I	2.63	3.42
J	3.42	4.20
K	4.20	5.04

### 0.56" Dual Digit

Bin ID	Customer Iv in mcd	
	Min.	Max.
<b>GaP Red</b> <span style="color:red">■</span> HDSP-52xE		
G	2.28	3.42
H	3.42	5.13
I	5.13	7.69
<b>GaP Yellow</b> <span style="color:yellow">■</span> HDSP-52xY		
F	1.52	2.28
G	2.28	3.42
H	3.42	5.13
<b>GaP Green</b> <span style="color:green">■</span> HDSP-52xG		
G	2.28	3.42
H	3.42	5.13
<b>AlGaAs Red</b> <span style="color:red">■</span> HDSP-52xA		
J	3.201	5.050
K	5.051	8.000
L	8.001	12.650

### 0.8" Single Digit

Bin ID	Customer Iv in mcd	
	Min.	Max.
<b>GaP Red</b> <span style="color:red">■</span> HDSP-81xE		
N	4.78	8.34
P	6.82	11.86
Q	9.7	16.61
<b>GaP Green</b> <span style="color:green">■</span> HDSP-81xG		
P	6.82	11.86
Q	9.7	16.61
R	13.6	23.74

# LED Indicators and Displays

## Standard Seven-Segment Displays

LED Standard Displays — Seven-Segment Displays  
Luminous Intensity Categories (Typ.)

### 10 mm (0.4") Slim Font Single Digit

Bin ID	Customer lv in mcd	
	Min.	Max.
<b>GaP Red</b>		
HDSP-30xE		
I	1.100	2.200
K	1.800	3.600
<b>GaP Green</b>		
HDSP-30xG		
K	1.800	3.600
L	2.800	5.600
<b>AlGaAs Red</b>		
HDSP-30xA		
F	0.280	0.560
G	0.450	0.900
<b>GaP Yellow</b>		
HDSP-30xY		
I	1.100	2.200
K	1.800	3.600

### 13 mm (0.56") Slim Font Single Digit

Bin ID	Customer lv in mcd	
	Min.	Max.
<b>GaP Red</b>		
HDSP-56xE		
I	1.100	2.200
K	1.800	3.600
<b>GaP Green</b>		
HDSP-56xG		
K	1.800	3.600
L	2.800	5.600
<b>AlGaAs Red</b>		
HDSP-56xA		
F	0.280	0.560
G	0.450	0.900
<b>GaP Yellow</b>		
HDSP-56xY		
I	1.100	2.200
K	1.800	3.600

### 10.16 mm (0.4"D) Dual Digit

Bin ID	Customer lv in mcd	
	Min.	Max.
<b>GaP Red</b>		
HDSP-G0xE		
H	1.251	2.000
I	2.001	3.200
J	3.201	5.050
<b>GaP Green</b>		
HDSP-G0xG		
H	1.251	2.000
I	2.001	3.200
J	3.201	5.050
<b>AlGaAs Red</b>		
HDSP-G0xA		
J	3.201	5.050
K	5.051	8.000
L	8.001	12.650
<b>GaP Yellow</b>		
HDSP-G0xY		
G	0.801	1.250
H	1.251	2.000
I	2.001	3.200

### 7.62 mm (0.3") Single Digit

Bin ID	Customer lv in mcd	
	Min.	Max.
<b>GaP Red</b>		
HDSP-33xE		
G	0.801	1.250
H	1.251	2.000
I	2.001	3.200
<b>GaP Green</b>		
HDSP-33xG		
G	0.801	1.250
H	1.251	2.000
I	2.001	3.200
<b>AlGaAs Red</b>		
HDSP-33xA		
I	2.001	3.200
J	3.201	5.050
K	5.051	8.000
<b>GaP Yellow</b>		
HDSP-33xY		
G	0.801	1.250
H	1.251	2.000
I	2.001	3.200

### 10.16 mm (0.4") Single Digit

Bin ID	Customer lv in mcd	
	Min.	Max.
<b>GaP Red</b>		
HDSP-31xE		
H	1.251	2.000
I	2.001	3.200
J	3.201	5.050
<b>GaP Green</b>		
HDSP-31xG		
H	1.251	2.000
I	2.001	3.200
J	3.201	5.050
<b>AlGaAs Red</b>		
HDSP-31xA		
J	3.201	5.050
K	5.051	8.000
L	8.001	12.650
<b>GaP Yellow</b>		
HDSP-31xY		
G	0.801	1.250
H	1.251	2.000
I	2.001	3.200

### 14.22 mm (0.56") Single Digit

Bin ID	Customer lv in mcd	
	Min.	Max.
<b>GaP Red</b>		
HDSP-51xE		
I	2.001	3.200
J	3.201	5.050
K	5.051	8.000
<b>GaP Green</b>		
HDSP-51xG		
I	2.001	3.200
J	3.201	5.050
K	5.051	8.000
<b>AlGaAs Red</b>		
HDSP-51xA		
J	3.201	5.050
K	5.051	8.000
L	8.001	12.650
<b>GaP Yellow</b>		
HDSP-51xY		
H	1.251	2.000
I	2.001	3.200
J	3.201	5.050

# LED Indicators and Displays

## Standard Seven-Segment Displays

Part Number	Face Color	Pin Configuration	Intensity ( $\mu\text{cd}$ )		I <sub>v</sub> Test Current (mA)	V <sub>f</sub> Typ. (V)	V <sub>f</sub> Test Current (mA)	2 Intensity Bin Selection
			Min.	Typ.				
<b>7.6 mm (0.3") Micro Bright Displays (right decimal point)</b>								
<b>GaP Red 626 nm</b> <span style="color:red">■</span>								
HDSP-7501	Grey	Common Anode	360	980	5	2	20	C,D
HDSP-A211	Black	Common Anode	360	980	5	2	20	
HDSP-7503	Grey	Common Cathode	360	980	5	2	20	C,D
HDSP-A213	Black	Common Cathode	360	980	5	2	20	C,D
<b>GaP Orange 600 nm</b> <span style="color:orange">■</span>								
HDSP-A401	Grey	Common Anode	354	720	5	2	20	
HDSP-A411	Black	Common Anode	354	720	5	2	20	
HDSP-A403	Grey	Common Cathode	354	720	5	2	20	
HDSP-A413	Black	Common Cathode	354	720	5	2	20	
<b>GaP Yellow 586 nm</b> <span style="color:yellow">■</span>								
HDSP-7401	Grey	Common Anode	225	480	5	2.2	20	D,E
HDSP-7403	Grey	Common Cathode	225	480	5	2.2	20	D,E
<b>High Performance Green 571 nm</b> <span style="color:green">■</span>								
HDSP-7801	Grey	Common Anode	860	3000	10	2.1	10	J,K
HDSP-A511	Black	Common Anode	860	3000	10	2.1	10	J,K
HDSP-7803	Grey	Common Cathode	860	3000	10	2.1	10	
HDSP-A513	Black	Common Cathode	860	3000	10	2.1	10	
<b>GaP AlGaAs Red 637 nm</b> <span style="color:red">■</span>								
HDSP-A151	Grey	Common Anode	690	1400	20	1.8	20	
HDSP-A153	Grey	Common Cathode	690	1400	20	1.8	20	
<b>7.6 mm (0.3") Micro Bright Low Current Displays (right decimal point)</b>								
<b>GaP AlGaAs Red 637 nm</b> <span style="color:red">■</span>								
HDSP-A101	Grey	Common Anode	315	600	1	1.6	1	F,G
HDSP-A111	Black	Common Anode	315	600	1	1.6	1	F,G
HDSP-A103	Grey	Common Cathode	315	600	1	1.6	1	F,G
HDSP-A113	Black	Common Cathode	315	600	1	1.6	1	
<b>GaP Red 626 nm</b> <span style="color:red">■</span>								
HDSP-7511	Grey	Common Anode	160	270	2	1.6	2	C,D
HDSP-7513	Grey	Common Cathode	160	270	2	1.6	2	C,D
<b>GaP Yellow 585 nm</b> <span style="color:yellow">■</span>								
HDSP-A801	Grey	Common Anode	250	420	4	1.7	4	
HDSP-A803	Grey	Common Cathode	250	420	4	1.7	4	
<b>GaP Green 571 nm</b> <span style="color:green">■</span>								
HDSP-A901	Grey	Common Anode	250	475	4	1.9	4	
HDSP-A903	Grey	Common Cathode	250	475	4	1.9	4	

# LED Indicators and Displays






## Standard Seven-Segment Displays

Part Number	Face Color	Pin Configuration	Intensity ( $\mu\text{cd}$ )		Iv Test Current (mA)	Vf Typ. (V)	Vf Test Current (mA)
			Min.	Typ.			
<b>7.6 mm (0.3") Micro Bright Overflow Displays (right decimal point)</b>							
<b>GaP Red 626 nm</b> <span style="color:red">■</span>							
HDSP-7507	Grey	Common Anode	360	980	5	2	20
HDSP-7508	Grey	Common Cathode	360	980	5	2	20
<b>GaP Orange 600 nm</b> <span style="color:orange">■</span>							
HDSP-A407	Grey	Common Anode	354	720	5	2	20
HDSP-A408	Grey	Common Cathode	354	720	5	2	20
<b>GaP Yellow 586 nm</b> <span style="color:yellow">■</span>							
HDSP-7407	Grey	Common Anode	225	480	5	2.2	20
HDSP-7408	Grey	Common Cathode	225	480	5	2.2	20
<b>GaP Green 571 nm</b> <span style="color:green">■</span>							
HDSP-7807	Grey	Common Anode	860	3000	10	2.1	10
HDSP-7808	Grey	Common Cathode	860	3000	10	2.1	10

Part Number	Face Color	Pin Configuration	Intensity		Iv Test Current (mA)	Vf Typ. (V)	Vf Test Current (mA)	2 Intensity Bin Selection	Decimal Point
			Min.	Typ.					
<b>7.6 mm (0.3") Single Digit Displays</b>									
<b>GaP Red 626 nm</b> <span style="color:red">■</span>									
5082-7610	Red	Common Anode	340	800	5	2.1	20	C,D	Left
5082-7611	Red	Common Anode	340	800	5	2.1	20		Right
5082-7613	Red	Common Cathode	340	800	5	2.1	20	C,D	Right
<b>GaP Yellow 586 nm</b> <span style="color:yellow">■</span>									
5082-7620	Yellow	Common Anode	205	620	5	2.2	20		Left
5082-7621	Yellow	Common Anode	205	620	5	2.2	20		Right
5082-7623	Yellow	Common Cathode	205	620	5	2.2	20		Right
<b>GaP Green 571 nm</b> <span style="color:green">■</span>									
HDSP-3600	Green	Common Anode	860	2700	10	2.1	10	K,L	Left
HDSP-3601	Green	Common Anode	860	2700	10	2.1	10		Right
HDSP-3603	Green	Common Cathode	860	2700	10	2.1	10		Right
<b>7.6 mm (0.3") Single Digit Overflow</b>									
<b>GaP Red 626 nm</b> <span style="color:red">■</span>									
5082-7616	Red	–	340	800	5	2.1	20		Right
<b>GaP Yellow 586 nm</b> <span style="color:yellow">■</span>									
5082-7626	Yellow	–	205	620	5	2.2	20		Right
<b>GaP Green 571 nm</b> <span style="color:green">■</span>									
HDSP-3606	Green	–	860	2700	10	2.1	10		Right

# LED Indicators and Displays

## Standard Seven-Segment Displays

Part Number	Face Color	Pin Configuration	Intensity ( $\mu\text{cd}$ )		Iv Test Current (mA)	Vf Typ. (V)	Vf Test Current (mA)	2 Intensity Bin Selection
			Min.	Typ.				
<b>8 mm (0.31") Micro Bright Displays (right decimal point)</b>								
<b>AlGaAs Red 637 nm</b> 								
HDSP-U101	Grey	Common Anode	315	600	1	1.8	20	
HDSP-U111	Black	Common Anode	315	600	1	1.8	20	
HDSP-U103	Grey	Common Cathode	315	600	1	1.8	20	
HDSP-U113	Black	Common Cathode	315	600	1	1.8	20	F,G
<b>GaP Red 626 nm</b> 								
HDSP-U201	Grey	Common Anode	360	980	5	2	20	
HDSP-U211	Black	Common Anode	360	980	5	2	20	C,D
HDSP-U203	Grey	Common Cathode	360	980	5	2	20	C,D
HDSP-U213	Black	Common Cathode	360	980	5	2	20	C,D
<b>GaP Orange 600 nm</b> 								
HDSP-U401	Grey	Common Anode	360	980	5	2	20	
HDSP-U411	Black	Common Anode	360	980	5	2	20	
HDSP-U403	Grey	Common Cathode	360	980	5	2	20	
HDSP-U413	Black	Common Cathode	360	980	5	2	20	
<b>GaP Yellow 586 nm</b> 								
HDSP-U301	Grey	Common Anode	225	480	5	2.2	20	
HDSP-U311	Black	Common Anode	225	480	5	2.2	20	
HDSP-U303	Grey	Common Cathode	225	480	5	2.2	20	
HDSP-U313	Black	Common Cathode	225	480	5	2.2	20	
<b>GaP Green 571 nm</b> 								
HDSP-U501	Grey	Common Anode	860	3000	10	2.1	10	
HDSP-U511	Black	Common Anode	860	3000	10	2.1	10	K,L
HDSP-U503	Grey	Common Cathode	860	3000	10	2.1	10	K,L
HDSP-U513	Black	Common Cathode	860	3000	10	2.1	10	K,L

# LED Indicators and Displays






## Standard Seven-Segment Displays

Part Number	Face Color	Pin Configuration	Intensity ( $\mu\text{cd}$ )		Iv Test Current (mA)	Vf Typ. (V)	Vf Test Current (mA)	2 Intensity Bin Selection
			Min.	Typ.				
<b>10 mm (0.4") Single Digit Displays (right decimal point)</b>								
<b>AlGaAs Red 637 nm</b>								
HDSP-F111	Black	Common Anode	330	650	1	1.6	1	
HDSP-F101	Grey	Common Anode	330	650	1	1.6	1	E,F
HDSP-F113	Black	Common Cathode	330	650	1	1.6	1	
HDSP-F103	Grey	Common Cathode	330	650	1	1.8	1	E,F
<b>GaP Red 626 nm</b>								
HDSP-F211	Black	Common Anode	420	1200	5	2	20	D,E
HDSP-F201	Grey	Common Anode	420	1200	5	2	20	D,E
HDSP-F213	Black	Common Cathode	420	1200	5	2	20	D,E
HDSP-F203	Grey	Common Cathode	420	1200	5	2	20	D,E
<b>GaP Orange 603 nm</b>								
HDSP-F411	Black	Common Anode	420	1200	5	2	20	
HDSP-F401	Grey	Common Anode	420	1200	5	2	20	
HDSP-F413	Black	Common Cathode	420	1200	5	2	20	
HDSP-F403	Grey	Common Cathode	420	1200	5	2	20	
<b>GaP Yellow 586 nm</b>								
HDSP-F301	Grey	Common Anode	290	800	5	2.2	20	D,E
HDSP-F303	Grey	Common Cathode	290	800	5	2.2	20	D,E
<b>GaP Green 571 nm</b>								
HDSP-F511	Black	Common Anode	1030	3500	10	2.1	10	I,J
HDSP-F501	Grey	Common Anode	1030	3500	10	2.1	10	J,K
HDSP-F513	Black	Common Cathode	1030	3500	10	2.1	10	I,J
HDSP-F503	Grey	Common Cathode	1030	3500	10	2.1	10	J,K
<b>10 mm (0.4") Overflow Displays (right decimal point)</b>								
<b>AlGaAs Red 637 nm</b>								
HDSP-F107	Grey	Common Anode	330	650	1	1.6	1	
HDSP-F108	Grey	Common Cathode	330	650	1	1.6	1	
<b>GaP Red 626 nm</b>								
HDSP-F207	Grey	Common Anode	420	1200	5	2	20	
HDSP-F208	Grey	Common Cathode	420	1200	5	2	20	
<b>GaP Orange 603 nm</b>								
HDSP-F407	Grey	Common Anode	420	1200	5	2	20	
HDSP-F408	Grey	Common Cathode	420	1200	5	2	20	
<b>GaP Yellow 586 nm</b>								
HDSP-F307	Grey	Common Anode	290	800	5	2.2	20	
HDSP-F308	Grey	Common Cathode	290	800	5	2.2	20	
<b>GaP Green 571 nm</b>								
HDSP-F507	Grey	Common Anode	1030	3500	10	2.1	10	
HDSP-F508	Grey	Common Cathode	1030	3500	10	2.1	10	








# LED Indicators and Displays

## Standard Seven-Segment Displays

Part Number	Face Color	Pin Configuration	Intensity ( $\mu\text{cd}$ )		Iv Test Current (mA)	Vf Typ. (V)	Vf Test Current (mA)
			Min.	Typ.			
<b>10 mm (0.4") Dual Digit Displays (right decimal point)</b>							
<b>AlGaAs Red 637 nm</b> 							
HDSP-G111	Black	Common Anode	330	650	1	1.6	1
HDSP-G101	Grey	Common Anode	330	650	1	1.6	1
HDSP-G113	Black	Common Cathode	330	650	1	1.6	1
HDSP-G103	Grey	Common Cathode	330	650	1	1.6	1
<b>GaP Red 626 nm</b> 							
HDSP-G211	Black	Common Anode	420	1200	5	2	2
HDSP-G201	Grey	Common Anode	420	1200	5	2	20
HDSP-G213	Black	Common Cathode	420	1200	5	2	20
HDSP-G203	Grey	Common Cathode	420	1200	5	2	20
<b>GaP Orange 603 nm</b> 							
HDSP-G411	Black	Common Anode	420	1200	5	2	20
HDSP-G401	Grey	Common Anode	420	1200	5	2	20
HDSP-G413	Black	Common Cathode	420	1200	5	2	20
HDSP-G403	Grey	Common Cathode	420	1200	5	2	20
<b>GaP Yellow 586 nm</b> 							
HDSP-G301	Grey	Common Anode	290	800	5	2.2	20
HDSP-G303	Grey	Common Cathode	290	800	5	2.2	20
<b>GaP Green 571 nm</b> 							
HDSP-G511	Black	Common Anode	1030	3500	10	2.1	10
HDSP-G501	Grey	Common Anode	1030	3500	10	2.1	10
HDSP-G513	Black	Common Cathode	1030	3500	10	2.1	10
HDSP-G503	Grey	Common Cathode	1030	3500	10	2.1	10

# LED Indicators and Displays

## Standard Seven-Segment Displays

Part Number	Face Color	Pin Configuration	Intensity		I <sub>v</sub> Test Current (mA)	V <sub>f</sub> Typ. (V)	V <sub>f</sub> Test Current (mA)	Decimal Point
			Min.	Typ.				
<b>10 mm (0.4") Slim Font Single Digit Displays</b>								
<b>AlGaAs Red 637 nm</b> 								
HDSP-315H	Grey	Common Anode	180	650	1	1.8	1	Right
HDSP-316H	Grey	Common Cathode	180	650	1	1.8	1	Right
<b>GaP Red 626 nm</b> 								
HDSP-315E	Grey	Common Anode	450	2600	10	1.9	10	Right
HDSP-316E	Grey	Common Cathode	450	2600	10	1.9	10	Right
<b>GaP Red 626 nm — Low Current</b> 								
HDSP-315L	Grey	Common Anode	180	370	2	2.1	2	Right
HDSP-316L	Grey	Common Cathode	180	370	2	2.1	2	Right
<b>GaP Yellow 586 nm</b> 								
HDSP-315Y	Grey	Common Anode	450	1800	10	2	10	Right
HDSP-316Y	Grey	Common Cathode	450	1800	10	2	10	Right
<b>GaP Green 571 nm</b> 								
HDSP-315G	Grey	Common Anode	450	5000	10	2.1	10	Right
HDSP-316G	Grey	Common Cathode	450	5000	10	2.1	10	Right






# LED Indicators and Displays

## Standard Seven-Segment Displays

Part Number	Face Color	Pin Configuration	Intensity		Iv Test Current (mA)	Vf Typ. (V)	Vf Test Current (mA)	2 Intensity Bin Selection	Decimal Point
			Min.	Typ.					
<b>10.9 mm (0.43") Single Digit Displays</b>									
<b>AlGaAs Red 637 nm</b>									
HDSP-E101	Grey	Common Anode	390	650	1	1.6	1	E,F	Right
HDSP-E103	Grey	Common Cathode	390	650	1	1.6	1		Right
<b>GaP Red 626 nm</b>									
5082-7650	Red	Common Anode	340	1115	5	2.1	20	D,E	Left
5082-7651	Red	Common Anode	340	1115	5	2.1	20	D,E	Right
5082-7653	Red	Common Cathode	340	1115	5	2.1	20	D,E	Right
<b>GaP Red 626 nm — Low Current</b>									
HDSP-3350	Red	Common Anode	200	300	2	1.6	2		Left
HDSP-3351	Red	Common Anode	200	300	2	1.6	2		Right
HDSP-3353	Red	Common Cathode	200	300	2	1.6	2		Right
<b>GaP Yellow 586 nm</b>									
5082-7660	Yellow	Common Anode	290	835	5	2.2	20		Left
5082-7661	Yellow	Common Anode	290	835	5	2.2	20		Right
5082-7663	Yellow	Common Cathode	290	835	5	2.2	20		Right
<b>GaP Green 571 nm</b>									
HDSP-4600	Grey	Common Anode	1030	4000	10	2.1	10		Left
HDSP-4601	Grey	Common Anode	1030	4000	10	2.1	10		Right
HDSP-4603	Grey	Common Cathode	1030	4000	10	2.1	10	I,J	Right
<b>10 mm (0.4") Slim Font Single Digit Displays</b>									
<b>AlGaAs Red 637 nm</b>									
HDSP-E106	Grey	—	390	650	1	1.6	1		Right
<b>GaP Red 626 nm</b>									
HDSP-E106	Grey	—	390	650	1	1.6	1		Right
<b>GaP Red 626 nm — Low Current</b>									
5082-7656	Red	—	340	1115	5	2.1	20		Right
<b>GaP Yellow 586 nm</b>									
5082-7666	Yellow	—	290	835	5	2.2	20		Right
<b>GaP Green 571 nm</b>									
HDSP-4606	Grey	—	1030	4000	10	2.1	10	I,J	Right

# LED Indicators and Displays

## Standard Seven-Segment Displays

Part Number	Face Color	Pin Configuration	Intensity		Iv Test Current (mA)	Vf Typ. (V)	Vf Test Current (mA)	2 Intensity Bin Selection	Decimal Point
			Min.	Typ.					
<b>13 mm (0.56") Slim Font Displays</b>									
<b>AlGaAs Red 637 nm</b> 									
HDSP-515H	Grey	Common Anode	180	650	1	1.8	1	G,H	Right
HDSP-516H	Grey	Common Cathode	180	650	1	1.8	1		Right
<b>GaP Red 626 nm</b> 									
HDSP-515E	Grey	Common Anode	450	2600	10	1.9	10		Right
HDSP-516E	Grey	Common Cathode	450	2600	10	1.9	10		Right
<b>GaP Red 626 nm — Low Current</b> 									
HDSP-515L	Grey	Common Anode	180	370	2	2.1	2	F,G	Right
HDSP-516L	Grey	Common Cathode	180	370	2	2.1	2		Right
<b>GaP Yellow 586 nm</b> 									
HDSP-515Y	Grey	Common Anode	450	1800	10	2	10		Right
HDSP-516Y	Grey	Common Cathode	450	1800	10	2	10		Right
<b>GaP Green 571 nm</b> 									
HDSP-515G	Grey	Common Anode	450	5000	10	2.1	10		Right
HDSP-516G	Grey	Common Cathode	450	5000	10	2.1	10		Right







# LED Indicators and Displays

## Standard Seven-Segment Displays

Part Number	Face Color	Pin Configuration	Intensity ( $\mu\text{cd}$ )		I <sub>v</sub> Test Current (mA)	V <sub>f</sub> Typ. (V)	V <sub>f</sub> Test Current (mA)	2 Intensity Bin Selection
			Min.	Typ.				
<b>14.2 mm (0.56") Single Digit Displays (right decimal point)</b>								
<b>AlGaAs Red 637 nm</b> <span style="color: red;">■</span>								
HDSP-H111	Black	Common Anode	400	700	1	1.6	1	D,E
HDSP-H101	Grey	Common Anode	400	700	1	1.6	1	D,E
HDSP-H113	Black	Common Cathode	400	700	1	1.6	1	
HDSP-H103	Grey	Common Cathode	400	700	1	1.6	1	D,E
<b>GaP Red 626 nm</b> <span style="color: red;">■</span>								
HDSP-H211	Black	Common Anode	900	2800	10	2	20	G,H
HDSP-5501	Grey	Common Anode	900	2800	10	2.1	20	G,H
HDSP-H213	Black	Common Cathode	900	2800	10	2	20	G,H
HDSP-5503	Grey	Common Cathode	900	2800	10	2.1	20	G,H
<b>GaP Red 626 nm — Low Current</b> <span style="color: red;">■</span>								
HDSP-5551	Grey	Common Anode	270	370	2	1.6	2	
HDSP-5553	Grey	Common Cathode	270	370	2	1.6	2	B,C
<b>GaP Orange 600 nm</b> <span style="color: orange;">■</span>								
HDSP-H411	Black	Common Anode	1190	2000	10	2	20	
HDSP-H401	Grey	Common Anode	1190	2000	10	2	20	
HDSP-H413	Black	Common Cathode	1190	2000	10	2	20	
HDSP-H403	Grey	Common Cathode	1190	2000	10	2	20	
<b>GaP Yellow 586 nm</b> <span style="color: yellow;">■</span>								
HDSP-5701	Grey	Common Anode	600	1800	10	2.1	20	F,G
HDSP-5703	Grey	Common Cathode	600	1800	10	2.1	20	F,G
<b>GaP Green 571 nm</b> <span style="color: green;">■</span>								
HDSP-H511	Black	Common Anode	900	2500	10	2.1	10	G,H
HDSP-5601	Grey	Common Anode	900	2500	10	2.1	10	G,H
HDSP-H513	Black	Common Cathode	900	2500	10	2.1	10	G,H
HDSP-5603	Grey	Common Cathode	900	2500	10	2.1	10	G,H

# LED Indicators and Displays

## Standard Seven-Segment Displays

Part Number	Face Color	Pin Configuration	Intensity ( $\mu\text{cd}$ )		Iv Test Current (mA)	Vf Typ. (V)	Vf Test Current (mA)	2 Intensity Bin Selection
			Min.	Typ.				
<b>14.2 mm (0.56") Overflow Displays (right decimal point)</b>								
<b>AlGaAs Red 637 nm</b> 								
HDSP-H107	Grey	Common Anode	400	700	1	1.6	1	
HDSP-H108	Grey	Common Cathode	400	700	1	1.6	1	
<b>GaP Red 626 nm</b> 								
HDSP-5507	Grey	Common Anode	900	2800	10	2.1	20	G,H
HDSP-5508	Grey	Common Cathode	900	2800	10	2.1	20	G,H
<b>GaP Red 626 nm — Low Current</b> 								
HDSP-5557	Grey	Common Anode	270	370	2	1.6	2	
HDSP-5558	Grey	Common Cathode	270	370	2	1.6	2	
<b>GaP Orange 600 nm</b> 								
HDSP-H407	Grey	Common Anode	1190	2000	10	2	20	
HDSP-H408	Grey	Common Cathode	1190	2000	10	2	20	
<b>GaP Yellow 586 nm</b> 								
HDSP-5707	Grey	Common Anode	600	1800	10	2.1	20	
HDSP-5708	Grey	Common Cathode	600	1800	10	2.1	20	
<b>GaP Green 571 nm</b> 								
HDSP-5607	Grey	Common Anode	900	2500	10	2.1	10	
HDSP-5608	Grey	Common Cathode	900	2500	10	2.1	10	






# LED Indicators and Displays

## Standard Seven-Segment Displays

Part Number	Face Color	Pin Configuration	Intensity		Iv Test Current (mA)	Vf Typ. (V)	Vf Test Current (mA)	2 Intensity Bin Selection	Decimal Point
			Min.	Typ.					
<b>20 mm (0.8") Single Digit Displays</b>									
<b>AlGaAs Red 637 nm</b> <span style="color:red">■</span>									
HDSP-N100	Grey	Common Anode	270	590	1	1.6	1		Left
HDSP-N101	Grey	Common Anode	270	590	1	1.6	1		Right
HDSP-N103	Grey	Common Cathode	270	590	1	1.6	1		Right
HDSP-N105	Grey	Common Cathode	270	590	1	1.6	1		Left
<b>GaP Red 626 nm</b> <span style="color:red">■</span>									
HDSP-3901	Grey	Common Anode	3350	7000 Peak (1/5 df)		2.6	100	E,F	Right
HDSP-3903	Grey	Common Cathode	3350	7000		2.6	100	E,F	Right
HDSP-3905	Grey	Common Cathode	3350	7000		2.6	100		Left
<b>GaP Orange 600 nm</b> <span style="color:orange">■</span>									
HDSP-N401	Grey	Common Anode	2230	– Peak (1/5 df)	100 mA	2.6	100		Right
HDSP-N403	Grey	Common Cathode	2230	–		2.6	100		Right
<b>GaP Yellow 586 nm</b> <span style="color:yellow">■</span>									
HDSP-4200	Grey	Common Left Hand	2200	7000 Peak (1/5 df)	100 mA	2.6	100		Left
HDSP-4201	Grey	Common Anode	2200	7000		2.6	100		Right
HDSP-4203	Grey	Common Cathode	2200	7000		2.6	100		Right
HDSP-4205	Grey	Common Cathode	2200	7000		2.6	100		Left
<b>GaP Green 571 nm</b> <span style="color:green">■</span>									
HDSP-8600	Grey	Common Anode	680	1500	10	2.1	10		Left
HDSP-8601	Grey	Common Anode	680	1500	10	2.1	10	E,F	Right
HDSP-8603	Grey	Common Cathode	680	1500	10	2.1	10	E,F	Right
HDSP-8605	Grey	Common Cathode	680	1500	10	2.1	10		Left

# LED Indicators and Displays

## Standard Seven-Segment Displays

Part Number	Face Color	Pin Configuration	Intensity		Iv Test Current (mA)	Vf Typ. (V)	Vf Test Current (mA)	Decimal Point
			Min.	Typ.				
<b>20 mm (0.8") Single Digit Overflow Displays</b>								
<b>AlGaAs Red 637 nm</b> 								
HDSP-N106	Grey	–	270	590	1	1.6	1	Left
<b>GaP Red 626 nm</b> 								
HDSP-3906	Grey	–	3350	7000 Peak (1/5 df)	100 mA	2.6	100	Right
<b>GaP Orange 600 nm</b> 								
HDSP-N406	Grey	–	2230	7000 Peak (1/5 df)	100 mA	2.6	100	Right
<b>GaP Yellow 586 nm</b> 								
HDSP-4206	Grey	–	2200	7000 Peak (1/5 df)	100 mA	2.6	100	Right
<b>GaP Green 571 nm</b> 								
HDSP-8606	Grey	–	680	1500	10	2.1	10	Right

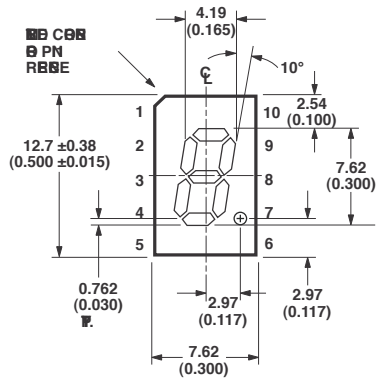


# LED Indicators and Displays

## Standard Seven-Segment Displays

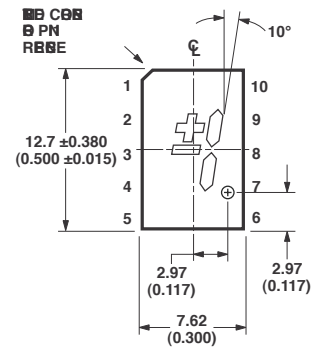
### 7.6 mm (0.3") Micro Bright Displays Package Dimension

Part Number		
HDSP-	A151	A211
	7501	A213
	A401	A511
	A411	A513
	7401	
	7801	
	A153	
	7503	
	A403	
	A413	
	7403	
	7803	



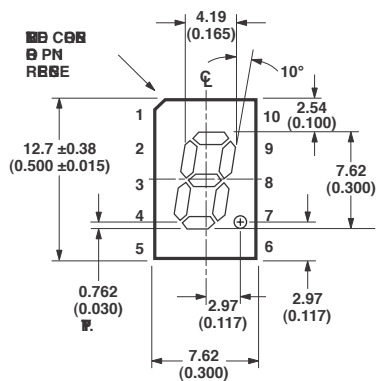
### 7.6 mm (0.3") Micro Bright Overflow Displays (Right Decimal Point) Package Dimension

Part Number	
HDSP-	7507
	A407
	7407
	7807
	7508
	A408
	7408
	7808



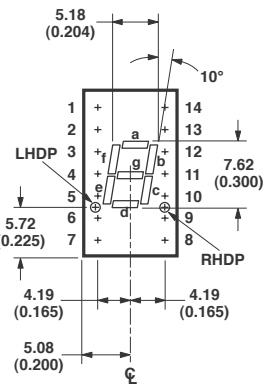
### 7.6 mm (0.3") Micro Bright Low Current Displays (Right Decimal Point) Package Dimension

Part Number		
HDSP-	A101	A111
	7511	A113
	A801	
	A901	
	A103	
	7513	
	A803	
A903		



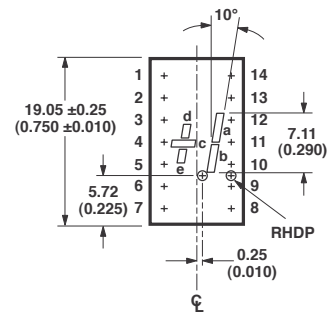
### 7.6 mm (0.3") Single Digit Displays Package Dimension

Part Number	
5802-	7610
	7611
	7613
	7620
	7621
	7623
	3600
	3601
3603	



### 7.6 mm (0.3") Overflow Displays Package Dimension

Part Number	
5802-	7616
	7626
	3606



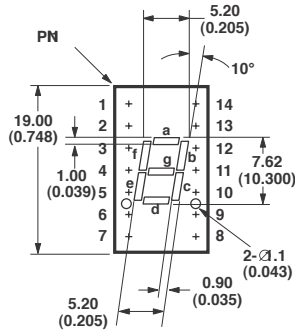
DIMENSIONS ARE IN MILLIMETERS (INCHES)

# LED Indicators and Displays

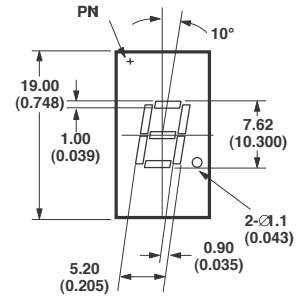
## Standard Seven-Segment Displays

### 7.62 mm (0.3") Single Digit Displays Package Dimension

Part Number		
HDSP-	331E	331A
	331G	331Y

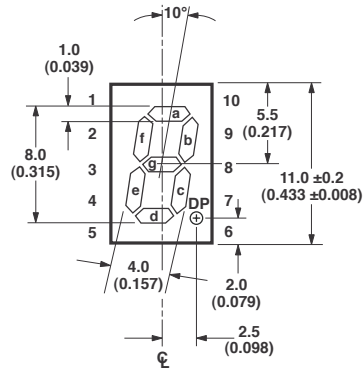


Part Number		
5802-	333E	334E
	333G	334G
	333A	334A
	333Y	334Y



### 8 mm (0.31") Micro Bright Displays Package Dimension

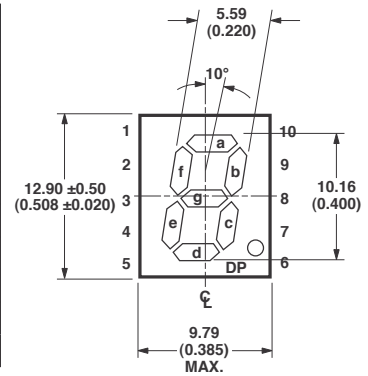
Part Number	
HDSP-	Uxxx



### 10 mm (0.4") Single Digit Displays

#### (Right Decimal Point) Package Dimension

Part Number		
HDSP-	F111	F113
	F211	F213
	F511	F513
	F101	F103
	F201	F203
	F401	F403
	F411	F413
	F301	F303
	F501	F503
	F511	F513



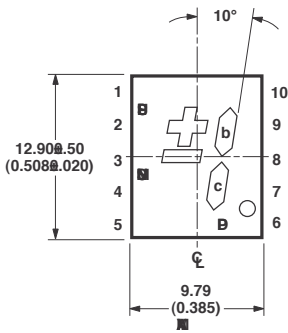
DIMENSIONS ARE IN MILLIMETERS (INCHES)

# LED Indicators and Displays

## Standard Seven-Segment Displays

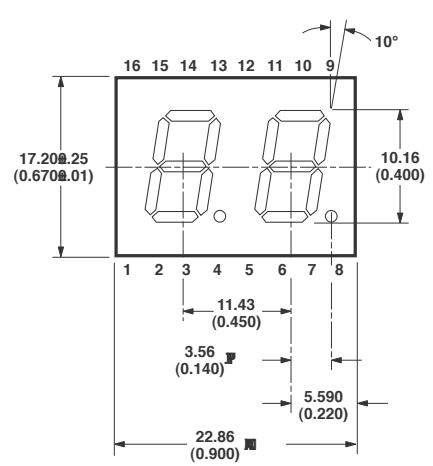
### 10 mm (0.4") Overflow Displays (Right Decimal Point) Package Dimension

Part Number		
HDSP-	F107	F108
	F207	F208
	F407	F408
	F307	F308
	F507	F508



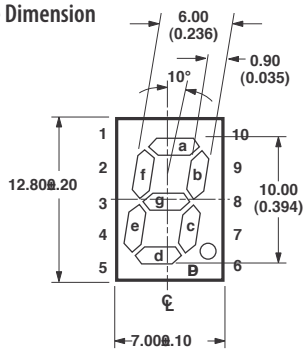
### 10 mm (0.4") Dual Digit Displays (Right Decimal Point) Package Dimension

Part Number		
HDSP-	G101	G103
	G111	G113
	G201	G203
	G211	G213
	G301	G303
	G401	G403
	G411	G413
	G501	G503
	G511	G513



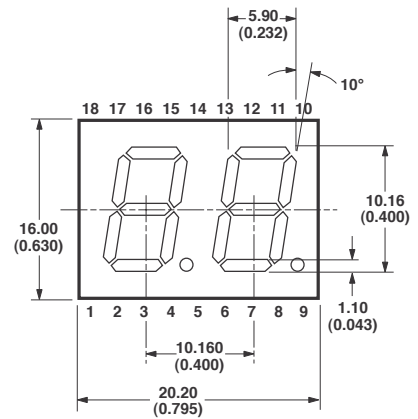
### 10 mm (0.4") Slim Font Single Digit Displays (Right Decimal Point) Package Dimension

Part Number		
HDSP-	315E	316E
	315L	316L
	315Y	316Y
	315G	316G
	30xE	30xG
	30xA	30xY



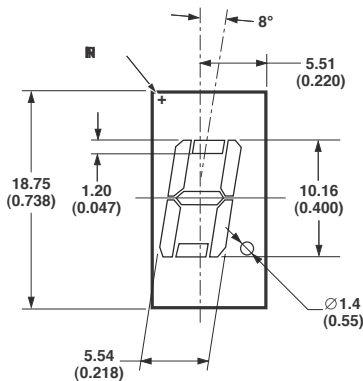
### 10.16 mm (0.4") Dual Digit Displays Package Dimension

Part Number		
HDSP-	G0xE	G0xG
	G0xA	G0xY

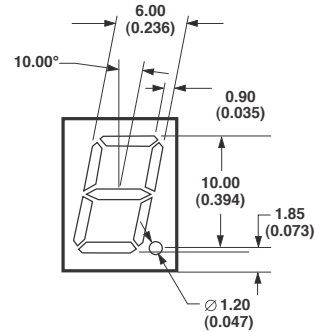


### 10.16 mm (0.4") Single Digit Displays Package Dimension

Part Number	
HDSP-	311E
	311G
	311A
	311Y



Part Number	
HDSP-	313E
	313G
	313A
	313Y



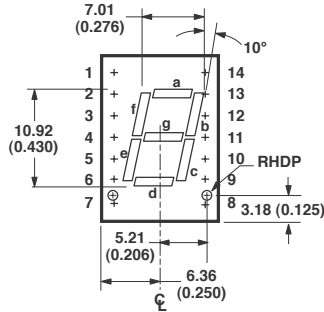
DIMENSIONS ARE IN MILLIMETERS (INCHES)

# LED Indicators and Displays

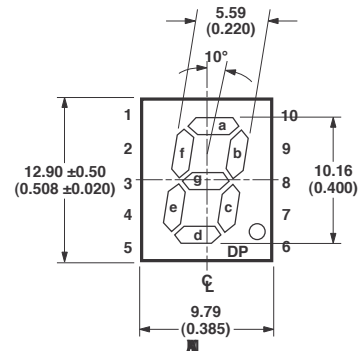
## Standard Seven Segment Displays

### 10.9 mm (0.43") Single Digit Displays (Right Decimal Point) Package Dimension

Part Number		
HDSP-	E101	E103
	3351	3353
5082-	7651	7653
	7661	7663
	4601	4603

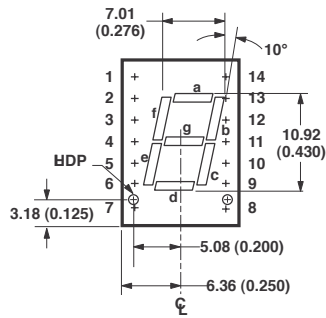


Part Number	
5802-	7650
	7660
	4600



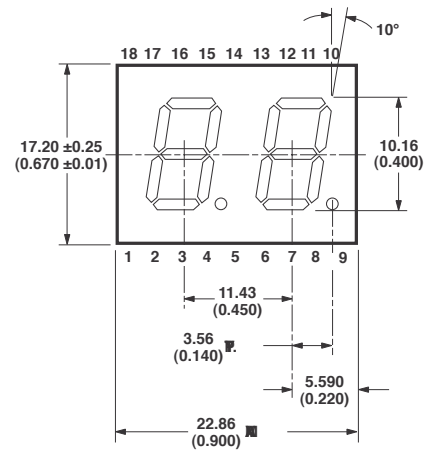
### 10.9 mm (0.43") Single Digit Displays Package Dimension

Part Number	
HDSP-	3350



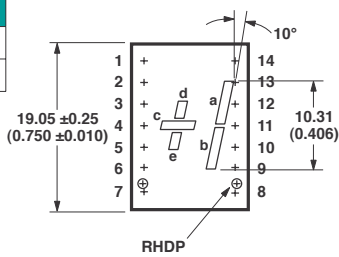
### 10.9 mm (0.43") Dual Digit Displays Package Dimension

Part Number		
HDSP-	G101	G103
	G201	G203
	G301	G303
	G401	G403
	G501	G503

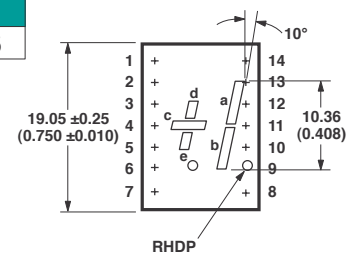


### 10.9 mm (0.43") Overflow Displays Package Dimension

Part Number		
HDSP-	4606	
	7656	7666
5082-	7656	7666



Part Number		
HDSP-	E106	3356



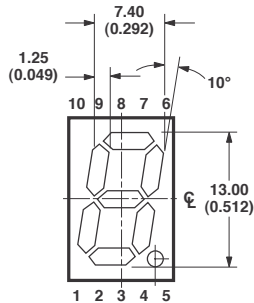
DIMENSIONS ARE IN MILLIMETERS (INCHES)

# LED Indicators and Displays

## Standard Seven Segment Displays

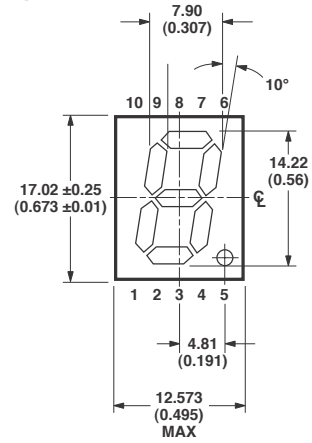
### 13 mm (0.56") Slim Font Displays Package Dimension

Part Number		
HDSP-	515H	516H
	515E	516E
	515L	516L
	515Y	516Y
	515G	516G
	56xE	56xG
	56xA	56xY



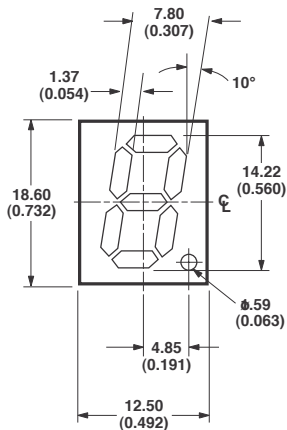
### 14.2 mm (0.56") Single Digit Displays (Right Decimal Point) Package Dimension

Part Number		
HDSP-	H111	H211
	H411	H511
	H113	H213
	H413	H513
	H101	H103
	H401	H403
	5551	5553
	5501	5503
	5701	5703
	5601	5603



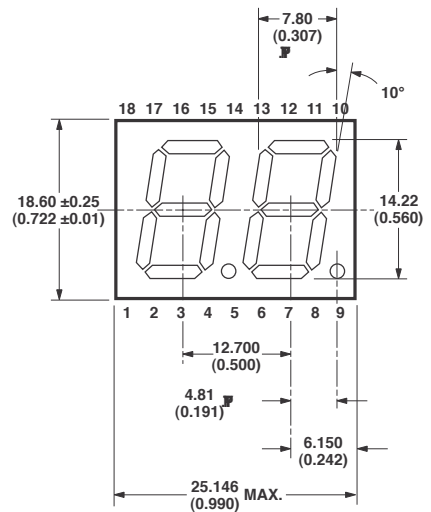
### 14.2 mm (0.56") Single Digit Displays (Right Decimal Point) Package Dimension

Part Number		
HDSP-	50xB	



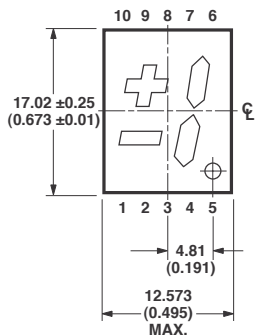
### 14.2 mm (0.56") Dual Digit Displays Package Dimension

Part Number		
HDSP-	52xA	52xE
	52xG	52xY



### 14.2 mm (0.56") Overflow Displays (Right Decimal Point) Package Dimension

Part Number		
HDSP-	H107	H108
	H407	H408
	5557	5558
	5507	5508
	5707	5708
	5607	5608



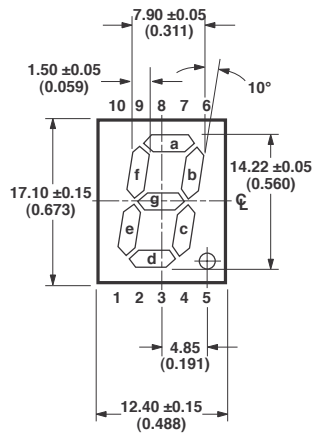
DIMENSIONS ARE IN MILLIMETERS (INCHES)

# LED Indicators and Displays

## Standard Seven-Segment Displays

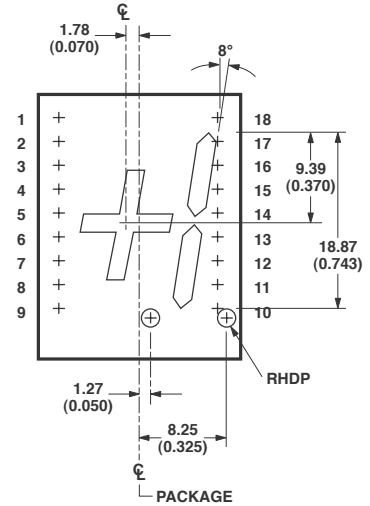
### 14.22 mm (0.56") Single Digit Displays Package Dimension

Part Number		
HDSP-	51xE	51xG
	51xA	51xY



### 20 mm (0.8") Single Digit Overflow Displays Package Dimension

Part Number		
HDSP-	N106	N406
	3906	4206
	8606	

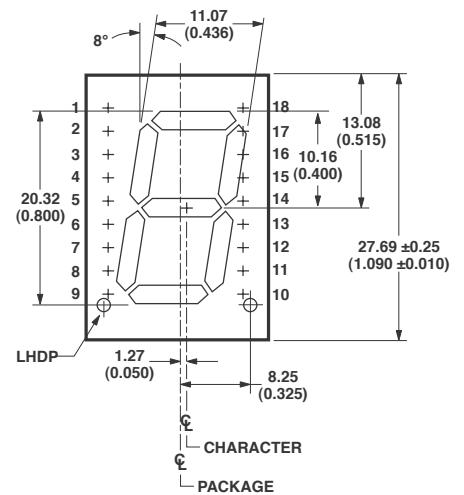
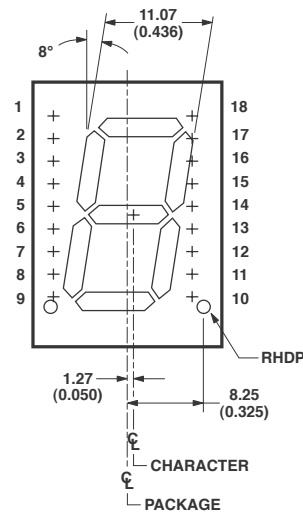
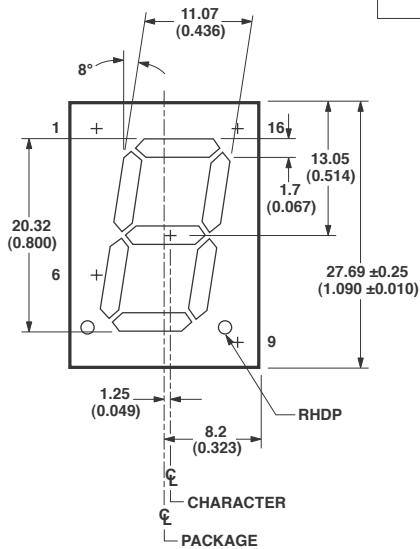


### 20 mm (0.8") Single Digit Displays Package Dimension

Part Number		
HDSP-	81xE	81xG

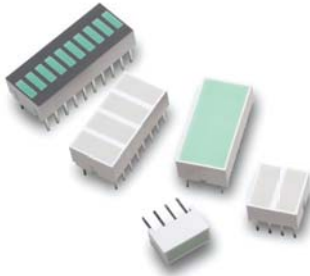
Part Number		
HDSP-	3901	3903
	4201	4203
	8601	8603
	N101	N103
	N401	N403

Part Number		
HDSP-	N100	N105
	3900	3905
	4200	4205
	8600	8605



DIMENSIONS ARE IN MILLIMETERS (INCHES)

## Light Bars and Bar Graph Arrays



### Description — Light Bars

Light Bars are Avago Technologies' innovative solution to fixed message annunciator. They are used as annunciators that serve three customer functions: status indication, backlighting fixed messages and analog level indications (arrays). The Light Bars provide exceptional brightness at very low drive current for those applications where portability and battery backup are vital. These rectangular light sources are configured in single-in-line and dual-in-line packages that contain either single or segmented light emitting areas. They are also X-Y stackable.

### Features & Benefits

- Large, bright, uniform light emitting surface
- Yellow and green categorized for dominant wavelength
- Low heat dissipation
- Choices of colors — Red, Green, Yellow
- Various package sizes are X-Y stackable
- Industry standard SIP and DIP packages

### Typical Applications

- Business machines
  - Point of sale bar code scanner
  - Electronic typewriters
  - Fax machines
  - Electronic scales
  - Postal meters
- Instrumentation
  - Process control system
  - Medical equipment
  - Machine control systems
  - Meters and status indicators
- Telecommunications
  - PBX systems
  - Modems
  - Central switching systems
  - Diagnostic equipment
  - Short wave radios
- Transportation
  - Automotive dashboards
  - Truck and bus controls
  - Airport passenger metal detectors
  - Ticket vending machines
- Consumer
  - Appliance front panel
  - Hi-Fi/stereo equipment
  - Alarm system

### Description — 10-Element Bar Graph Arrays

Avago Technologies' 10-Element Bar Graph Arrays serve a market need for analog level indication. LED reliability, light emitting viewability make them suitable in place of mechanical meters. They are designed to display information in easily recognizable bar graph form. The packages are end stackable and are therefore capable of displaying long strings of information. The bar graph arrays are precision matched for both intensity and wavelength, saving you the time and trouble of matching individual parts. The prealigned bar graph elements locked in a single package eliminates the task of matching and aligning individual LEDs during manufacturing, along with the risk of visually substandard front panels resulting from misaligned indicators. Each device offers easy-to-handle packages that are compatible with standard DIP sockets.

### Features & Benefits

- Exclusive package interlock
  - Facilitate end stacking alignment
- Large segment size
  - Wide viewing angle
- Available in Red, Green, Yellow and multicolor
- Wide variety of applications
- Categorized and packaged for luminous intensity
  - Greater uniformity of light output
- Matched LEDs for uniform appearance

### Typical Applications

- Instrumentation
  - Meters
  - Channel indicators
  - Status indicators
- Process control
  - Level indicators
- Appliances
  - Status of indication
  - Mode of operation
- Transportation
  - Tachometers
  - Fuel gauges
- Consumer products
  - VU meters (stereos)
  - Radio channel scanners
  - Burglar alarms

# LED Indicators and Displays

## Light Bars

Shape	Size/# Light Emitting	Part Number	Color	Chip (nm) Typ.	Vf (V) Typ.	Vf (V) at If = mA	Iv at If = mA	Iv Min. (mcd)	Iv Typ. (mcd)	2 Intensity Bin Selection
0.4SIP	0.35" x 0.15" 1 area	HLCP-A100	AlGaAs Red	637	1.8	20	3	3	7.5	B, C
0.4SIP	0.35" x 0.15" 1 area	HLMP-2300	GaP Red	626	2	20	20	6	23	E, F
0.4SIP	0.35" x 0.15" 1 area	HLMP-2400	GaP Yellow	585	2.1	20	20	6	20	E, F
0.4SIP	0.35" x 0.15" 1 area	HLMP-2500	GaP Green	572	2.2	20	20	5	25	F, G
0.8SIP	0.75" x 0.15" 1 area	HLCP-B100	AlGaAs Red	637	1.8	20	3	6	15	B, C
0.8SIP	0.75" x 0.15" 1 area	HLMP-2350	GaP Red	626	2	20	20	13	45	E, F
0.8SIP	0.75" x 0.15" 1 area	HLMP-2450	GaP Yellow	585	2.1	20	20	13	38	E, F
0.8SIP	0.75" x 0.15" 1 area	HLMP-2550	GaP Green	572	2.2	20	20	11	50	F, G
0.4DIP	0.35" x 0.35" 1 area	HLCP-C100	AlGaAs Red	637	1.8	20	3	6	15	—
0.4DIP	0.35" x 0.35" 1 area	HLMP-2655	GaP Red	626	2	20	20	13	45	E, F
0.4DIP	0.35" x 0.35" 1 area	HLMP-2755	GaP Yellow	585	2.1	20	20	13	38	E, F
0.4DIP	0.35" x 0.35" 1 area	HLMP-2855	GaP Green	572	2.2	20	20	11	50	F, G
0.4DIP	0.35" x 0.15" 2 areas	HLCP-D100	AlGaAs Red	637	1.8	20	3	3	7.5	B, C
0.4DIP	0.35" x 0.15" 2 areas	HLMP-2600	GaP Red	626	2	20	20	6	23	E, F
0.4DIP	0.35" x 0.15" 2 areas	HLMP-2700	GaP Yellow	585	2.1	20	20	6	20	E, F
0.4DIP	0.35" x 0.15" 2 areas	HLMP-2800	GaP Green	572	2.1	20	20	5	25	—
0.8DIP	0.35" x 0.15" 4 areas	HLCP-E100	AlGaAs Red	637	1.8	20	3	3	7.5	B, C
0.8DIP	0.35" x 0.15" 4 areas	HLMP-2620	GaP Red	626	2	20	20	6	23	E, F
0.8DIP	0.35" x 0.15" 4 areas	HLMP-2720	GaP Yellow	585	2.1	20	20	6	20	E, F
0.8DIP	0.35" x 0.15" 4 areas	HLMP-2820	GaP Green	572	2.2	20	20	5	25	F, G
0.8DIP	0.15" x 0.75" 2 areas	HLCP-F100	AlGaAs Red	637	1.8	20	3	6	15	—
0.8DIP	0.15" x 0.75" 2 areas	HLMP-2635	GaP Red	626	2	20	20	13	45	—
0.8DIP	0.15" x 0.75" 2 areas	HLMP-2735	GaP Yellow	585	2.1	20	20	13	38	—
0.8DIP	0.15" x 0.75" 2 areas	HLMP-2835	GaP Green	572	2.2	20	20	11	50	—
0.8DIP	0.35" x 0.35" 2 areas	HLCP-G100	AlGaAs Red	637	1.8	20	3	6	15	—
0.8DIP	0.35" x 0.35" 2 areas	HLMP-2670	GaP Red	626	2	20	20	13	45	—
0.8DIP	0.35" x 0.35" 2 areas	HLMP-2770	GaP Yellow	585	2.1	20	20	13	38	—
0.8DIP	0.35" x 0.35" 2 areas	HLMP-2870	GaP Green	572	2.2	20	20	11	50	F, G
0.8DIP	0.35" x 0.75" 1 areas	HLCP-H100	AlGaAs Red	637	1.8	20	3	12	30	B, C
0.8DIP	0.35" x 0.75" 1 areas	HLMP-2685	GaP Red	626	2	20	20	22	80	—
0.8DIP	0.35" x 0.75" 1 areas	HLMP-2785	GaP Yellow	585	2.1	20	20	26	70	E, F
0.8DIP	0.35" x 0.75" 1 areas	HLMP-2885	GaP Green	572	2.2	20	20	22	100	F, G



# LED Indicators and Displays

## Bicolor Light Bars

Shape	Size/# Light Emitting	Part Number	Color	Chip (nm) Typ.	Vf (V) Typ.	Vf (V) at If = mA	Iv at If = mA	Iv Min. (mcd)	Iv Typ. (mcd)	2 Intensity Bin Selection
0.4DIP	0.35" x 0.35" 1 area	HLMP-2950	GaP Red	626	2	20	20	13	45	–
			GaP Yellow	585	2.1	20	20	13	38	–
0.4DIP	0.35" x 0.35" 1 area	HLMP-2965	GaP Red	626	2	20	20	19	45	–
			GaP Green	572	2.2	20	20	25	50	–

## Bar Graph Arrays

10 Element	HLCP-J100	AlGaAs Red	637	1.6	1	1	600	1000	–
	HDSP-4830	GaP Red	626	2.1	20	10	900	3500	G, H
	HDSP-4840	GaP Yellow	585	2.2	20	10	600	1900	F, G
	HDSP-4850	GaP Green	572	2.1	10	10	600	1900	H, I
Multicolor LA	HDSP-4832	GaP Red	626	2.1	20	10	600	3500	–
		GaP Yellow	585	2.2	20	10	600	1900	–
		GaP Green	572	2.1	10	10	600	1900	–
	HDSP-4836	GaP Red	626	2.1	20	10	600	3500	–
		GaP Yellow	585	2.2	20	10	600	1900	–
		GaP Green	572	2.1	10	10	600	1900	–
		GaP Yellow	585	2.2	20	10	600	1900	–
		GaP Red	626	2.1	20	10	600	3500	–

## Luminous Intensity Categories

### LED Light Bars

Bin ID	Customer Iv in mcd	
	Min.	Max.
AlGaAs Red HLCP-A100 / D100 / E100 GaP Red HLMP-2300 / 2600 / 2620		
B	4.5	8.2
C	6.8	12.1
D	10.1	18.5
E	15.3	27.8
F	22.8	45.5
AlGaAs Red HLCP-B100 / C100 / F100 / G100 GaP Red HLMP-2350 / 2635 / 2655 / 2670		
B	9.0	16.0
C	13.1	24.0
D	19.7	36.1
E	29.6	54.2
F	44.9	88.8
AlGaAs Red HLCP-H100 GaP Red HLMP-2685		
B	18.0	27.1
C	22.0	40.8
D	33.3	61.1
E	50.0	91.8
F	75.1	150.0

Bin ID	Customer Iv in mcd	
	Min.	Max.
GaP Yellow HLMP-2400 / 2700 / 2720		
E	13.8	25.3
F	20.7	41.4
HLMP-2450 / 2735 / 2755 / 2770		
E	27.0	50.0
F	40.5	81.0
HLMP-2785		
E	54.0	99.0
F	81.0	162.0
GaP Green HLMP-2500 / 2800 / 2820		
F	18.9	37.8
G	30.6	61.2
HLMP-2550 / 2835 / 2855 / 2870		
F	38.1	76.2
G	61.6	123.2
HLMP-2885		
F	75.1	150.3
G	121.1	242.2

### Bicolor Light Bars

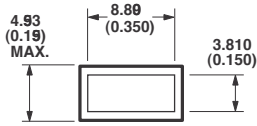
Bin ID	Customer Iv in mcd	
	Min.	Max.
HLMP-2950/GaP Red		
D	17.00	31.00
E	25.40	46.50
F	38.10	76.20
GaP Yellow		
D	18.00	33.00
E	27.00	50.00
F	40.50	81.00
HLMP-2965/GaP Red		
F	44.90	88.80
G	71.90	143.80
GaP Green		
F	38.10	76.20
G	61.60	123.20

### Bar Graph Arrays

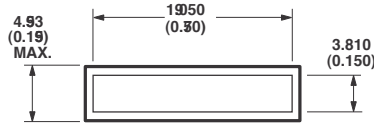
Bin ID	Customer Iv in mcd	
	Min.	Max.
AlGaAs Red/HLCP-J100 GaP Red/GaP Yellow/GaP Green HDSP-4830 / 4840 / 4850		
D	0.61	1.11
E	0.91	1.67
F	1.37	2.51
G	2.05	3.76
H	3.08	5.64
I	4.62	8.64

# LED Indicators and Displays

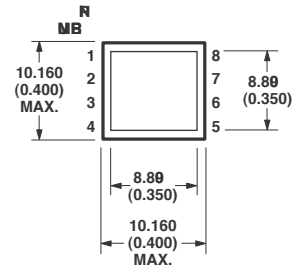
## LED Light Bar and Bar Graph Array Package Dimension Drawings



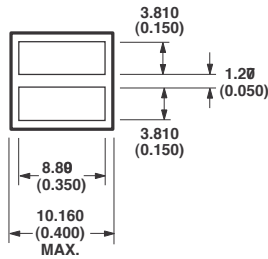
HLCP-A100  
HLMP-2300/2400/2500



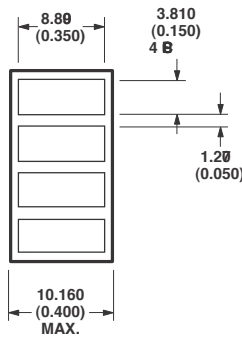
HLCP-B100  
HLMP-2x50



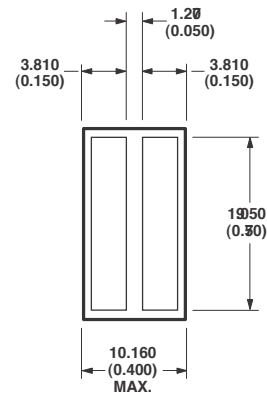
HLCP-C100  
HLMP-2x55



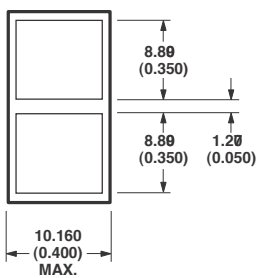
HLCP-D100  
HLMP-2600/2700/2800



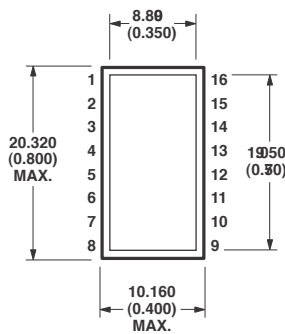
HLCP-E100  
HLMP-2x20



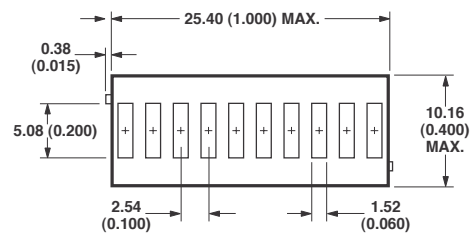
HLCP-F100  
HLMP-2x35



HLCP-G100  
HLMP-2x70

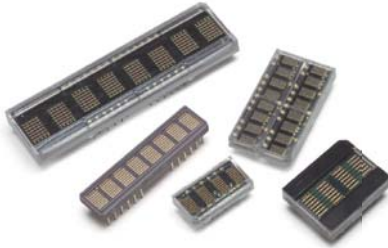


HLCP-H100  
HLMP-2x85



HLCP-J100  
HDSP-48x0

DIMENSIONS ARE IN MILLIMETERS (INCHES)



## Smart Displays

### Description

Avago Technologies offers high quality Smart Displays to meet a wide range of applications and requirements. The Smart Displays are available in both serial and parallel interface and have an ASIC driver that greatly simplifies design efforts. The Smart Displays are LED technology-based and are extremely reliable with a long life expectancy. They are resistant to extreme weather conditions, and to mechanical vibration and shock, making them suitable for industrial applications where maintenance resources are scarce. They are also suitable for the consumer market where the need for aesthetics and product differentiation provides a competitive advantage to our customers' end products. Avago Technologies' Smart Display products are positioned to support high volume and cost-effective solutions.

### Features and Benefits

- Robust design for high reliability, longer life and hot and cold temperature operating capability
  - Ideally suited for outdoor, industrial and automotive applications
- Alphanumeric characters and custom icons for messaging
  - Useful for conveying operating modes, status, warning and error codes
- Ability to flash or blink
  - Catch user's attention
- ASIC LED driver
  - Simplified design interfacing reduces design cycle time
- Emissive display with brightness control
  - Ability to modify brightness for subdued light environment and total darkness
- Aesthetically pleasing
  - Distinctive display allows product differentiation

### Typical Applications

- Industrial Equipment
  - Industrial ovens, reliability test equipment, analytical instruments, process control equipment, test and measuring instruments, temperature controllers, programmable logic controllers, security systems
- Networking
  - Telecommunication equipment, answering machines, telephones, base stations, PBX modems, network cards
- Outdoor Signs
  - Petrol pump meters
- Consumer
  - Audio/video equipment, audio mixers, set top boxes, amplifiers, musical instruments, gaming machines, currency/coin counters, security systems
- Consumer "White Goods"
  - Displays for washing machine digital panels, cookers, freezers and dishwashers
- Medical Equipment
  - Hospital monitoring systems
- Transportation
  - Displays, radar detectors, avionics displays
- Computers and Peripherals
  - CPU speed indicator, printer front panels, fax machines, copy machines, power supply equipment, cash registers

# LED Indicators and Displays

## Plastic Package, Serial Interface, 5 x 7 Dot Matrix Display with Custom Font Programmable

Part Number	Character	Color	Interface	Character Height (mm)	Intensity, Typ. (µcd)	Supply, Typ. (mA)
HCMS-2901	4	Yellow	Serial	3.7	64	132
HCMS-2902	4	Red	Serial	3.7	64	132
HCMS-2903	4	Green	Serial	3.7	114	132
HCMS-2904	4	Orange	Serial	3.7	64	132
HCMS-2905	4	AlGaAs Red	Serial	3.7	230	145
HCMS-2911	8	Yellow	Serial	3.7	64	264
HCMS-2912	8	Red	Serial	3.7	64	264
HCMS-2913	8	Green	Serial	3.7	114	264
HCMS-2914	8	Orange	Serial	3.7	64	264
HCMS-2915	8	AlGaAs Red	Serial	3.7	230	290
HCMS-2919	8	Blue	Serial	3.71	170	264
HCMS-2921	16	Yellow	Serial	3.7	64	528
HCMS-2922	16	Red	Serial	3.7	64	528
HCMS-2923	16	Green	Serial	3.7	114	528
HCMS-2924	16	Orange	Serial	3.7	64	528
HCMS-2925	16	AlGaAs Red	Serial	3.7	230	580
HCMS-2961	4	Yellow	Serial	4.6	64	132
HCMS-2962	4	Red	Serial	4.6	64	132
HCMS-2963	4	Green	Serial	4.6	114	132
HCMS-2964	4	Orange	Serial	4.6	64	132
HCMS-2965	4	AlGaAs Red	Serial	4.6	230	145
HCMS-2971	8	Yellow	Serial	4.6	64	264
HCMS-2972	8	Red	Serial	4.6	64	264
HCMS-2973	8	Green	Serial	4.6	114	264
HCMS-2974	8	Orange	Serial	4.6	64	264
HCMS-2975	8	AlGaAs Red	Serial	4.6	230	290
HCMS-2976	8	Blue	Serial	4.57	170	264
HCMS-3901	4	Yellow	Serial	3.71	148	132
HCMS-3902	4	Red	Serial	3.7	64	132
HCMS-3903	4	Green	Serial	3.71	252	132
HCMS-3904	4	Orange	Serial	3.7	64	132
HCMS-3906	4	Red	Serial	3.7	1150	132
HCMS-3907	4	Green	Serial	3.7	500	132
HCMS-3911	8	Yellow	Serial	3.71	148	264
HCMS-3912	8	Red	Serial	3.7	64	264
HCMS-3913	8	Green	Serial	3.71	252	264
HCMS-3914	8	Orange	Serial	3.7	64	264
HCMS-3916	8	Red	Serial	3.7	1150	264
HCMS-3917	8	Green	Serial	3.7	500	264
HCMS-3961	4	Yellow	Serial	4.57	148	132
HCMS-3962	4	Red	Serial	4.6	64	132
HCMS-3963	4	Green	Serial	4.57	252	132
HCMS-3964	4	Orange	Serial	4.6	64	132
HCMS-3966	4	Red	Serial	4.6	1150	132
HCMS-3967	4	Green	Serial	4.6	500	132
HCMS-3971	8	Yellow	Serial	4.57	148	264
HCMS-3972	8	Red	Serial	4.6	64	264
HCMS-3973	8	Green	Serial	4.57	252	264
HCMS-3974	8	Orange	Serial	4.6	64	264
HCMS-3976	8	Red	Serial	4.6	1150	264
HCMS-3977	8	Green	Serial	4.6	500	264

**Notes:**

Typical values at T<sub>A</sub> = 25°C.

Luminous intensity for one pixel at V<sub>LED</sub> = 5.0 V, 50% peak pixel current, 100% pulse width.

Supply current at V<sub>LED</sub> = 5.0V, 100% peak pixel current, 100% pulse width, 20 pixels per digit at all digit locations.

## LED Indicators and Displays

### Plastic Package, Serial Interface, 5 x 7 Dot Matrix Display with Custom Font Programmable

Part Number	Character	Color	Interface	Character Height (mm)	Intensity, Typ. ( $\mu$ cd)	Supply, Typ. (mA)
HDLY-1414	4	Yellow	Parallel	3.6	3.7	110
HDLO-1414	4	Red	Parallel	3.6	3.5	110
HDLG-1414	4	Green	Parallel	3.6	5.6	110
HDLA-1414	4	Orange	Parallel	3.6	3.5	110
HDLU-1414	4	AlGaAs Red	Parallel	3.6	3.1	34
HDLS-1414	4	AlGaAs Red	Parallel	3.6	12.7	125
HDLY-2416	4	Yellow	Parallel	5.1	3.7	110
HDLO-2416	4	Red	Parallel	5.1	3.5	110
HDLG-2416	4	Green	Parallel	5.1	5.6	110
HDLA-2416	4	Orange	Parallel	5.1	3.5	110
HDLU-2416	4	AlGaAs Red	Parallel	5.1	3.1	34
HDLS-2416	4	AlGaAs Red	Parallel	5.1	12.7	125
HDLY-3416	4	Yellow	Parallel	6.9	3.7	110
HDLO-3416	4	Red	Parallel	6.9	3.5	110
HDLG-3416	4	Green	Parallel	6.9	5.6	110
HDLA-3416	4	Orange	Parallel	6.9	3.5	110

### Plastic Package, Parallel Interface, 8 Character, 5 x 7 Dot Matrix Display with 128 Character ASCII Decoder

Part Number	Character	Color	Interface	Character Height (mm)	Intensity, Typ. ( $\mu$ cd)	Supply, Typ. (mA)
HDSP-2530	8	Orange	Parallel	4.6	7.5	300
HDSP-2531	8	Yellow	Parallel	4.6	7.	300
HDSP-2532	8	Red	Parallel	4.6	7.5	300
HDSP-2533	8	Green	Parallel	4.6	7.5	300
HDSP-2534	8	AlGaAs Red	Parallel	4.6	15	330
HDSP-2110	8	Orange	Parallel	4.8	7.5	300
HDSP-2111	8	Yellow	Parallel	4.8	7.5	300
HDSP-2112	8	Red	Parallel	4.8	7.5	300
HDSP-2113	8	Green	Parallel	4.8	7.5	300
HDSP-2107	8	AlGaAs Red	Parallel	4.8	15	330
HDSP-2500	8	Orange	Parallel	7.0	7.5	300
HDSP-2501	8	Yellow	Parallel	7.0	7.5	300
HDSP-2502	8	Red	Parallel	7.0	7.5	300
HDSP-2503	8	Green	Parallel	7.0	7.5	300
HDSP-2504	8	AlGaAs Red	Parallel	7.0	1.5	330

**Notes:**

Typical values at  $V_{DD} = 5.0V$ ,  $T_A = 25^\circ C$ .

Luminous intensity at 100% full brightness, character average with “#” (20 pixels) displayed.

Supply current at 100% brightness, with all character locations displaying “#” (20 pixels).

# LED Indicators and Displays

## Glass/Ceramic Package, Parallel Interface, 8 Character, 5 x 7 Dot Matrix with 128 Character ASCII Decoder

Part Number	Character	Color	Interface	Character Height (mm)	Intensity, Typ. (μcd)	Supply, Typ. (mA)
HDSP-2131	8	Yellow	Parallel	4.8	7.5	300
HDSP-2132	8	Red	Parallel	4.8	7.5	300
HDSP-2133	8	Green	Parallel	4.8	7.5	300
HDSP-2179	8	Orange	Parallel	4.8	7.5	300

**Notes:**

Typical values at  $V_{DD} = 5.0V$ ,  $T_A = 25^\circ C$ .

Luminous intensity at 100% full brightness, character average with “#” (20 pixels) displayed.

Supply current at 100% brightness, with all character locations displaying “#” (20 pixels).

## Plastic Package, Parallel Interface, 16 Segment Alphanumeric Display, 4 Character with 64 Character ASCII Decoder

Part Number	Character	Color	Interface	Character Height (mm)	Intensity, Typ. (μcd)	Supply, Typ. (mA)
HPDL-1414	4	Red	Parallel	2.9	1.0	70

**Notes:**

Typical values at  $V_{DD} = 5.0V$ ,  $T_A = 25^\circ C$ .

Luminous intensity at 100% full brightness, character average with “#” (20 pixels) displayed.

Supply current at 100% brightness, with all character locations displaying “#” (20 pixels).

## Glass/Ceramic Package, 4 x 7 Hexadecimal Display with Built-in BCD Decoder/Driver

Part Number	Description/Decimal Point	Color	Operation Temperature (°C)	Character Height (mm)	Luminous Intensity Typ. (μcd)	Supply Current Typ. (mA)
HDSP-0760	Numeric, RHDP	HER	-55 to 85	7.4	140	78
HDSP-0761	Numeric, LHDP	HER	-55 to 85	7.4	140	78
HDSP-0762	Hexadecimal	HER	-55 to 85	7.4	140	78
HDSP-0770	Numeric, RHDP	HER	-55 to 85	7.4	620	120
HDSP-0771	Numeric, LHDP	HER	-55 to 85	7.4	620	120
HDSP-0772	Hexadecimal	HER	-55 to 85	7.4	620	120
HDSP-0781	Numeric, RHDP	HER	-55 to 100	7.4	140	78
HDSP-0782	Numeric, LHDP	HER	-55 to 100	7.4	140	78
HDSP-0784	Hexadecimal	HER	-55 to 100	7.4	140	78
HDSP-0791	Numeric, RHDP	HER	-55 to 100	7.4	620	120
HDSP-0792	Numeric, LHDP	HER	-55 to 100	7.4	620	120
HDSP-0794	Hexadecimal	HER	-55 to 100	7.4	620	120
HDSP-0860	Numeric, RHDP	Yellow	-55 to 85	7.4	490	120
HDSP-0861	Numeric, LHDP	Yellow	-55 to 85	7.4	490	120
HDSP-0862	Hexadecimal	Yellow	-55 to 85	7.4	490	120
HDSP-0881	Numeric, RHDP	Yellow	-55 to 100	7.4	490	120
HDSP-0884	Hexadecimal	Yellow	-55 to 100	7.4	490	120
HDSP-0960	Numeric, RHDP	Green	-55 to 85	7.4	1100	120
HDSP-0961	Numeric, LHDP	Green	-55 to 85	7.4	1100	120
HDSP-0962	Hexadecimal	Green	-55 to 85	7.4	1100	120
HDSP-0981	Numeric, RHDP	Green	-55 to 100	7.4	1100	120
HDSP-0984	Hexadecimal	Green	-55 to 100	7.4	1100	120

**Notes:**

Typical values at  $V_{DD} = 5.0V$ ,  $T_A = 25^\circ C$ .

Luminous intensity per LED (Digit Average).

Supply current with “5” or “B” character displayed.

## Glass/Ceramic Package Over Range ± with Built-in BCD Decoder/Driver

Part Number	Description/Decimal Point	Color	Operation Temperature (°C)	Character Height (mm)	Luminous Intensity Typ. (μcd)	Supply Current Typ. (mA)
HDSP-0763	Overrange ± 1	HER	-55 to 85	7.4	140	11.2
HDSP-0863	Overrange ± 1	Yellow	-55 to 85	7.4	490	32
HDSP-0963	Overrange ± 1	Green	-55 to 85	7.4	1100	32

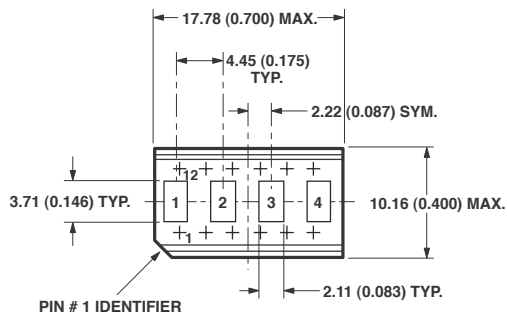
**Notes:**

Typical values at  $V_{DD} = 5.0V$ ,  $T_A = 25^\circ C$ .

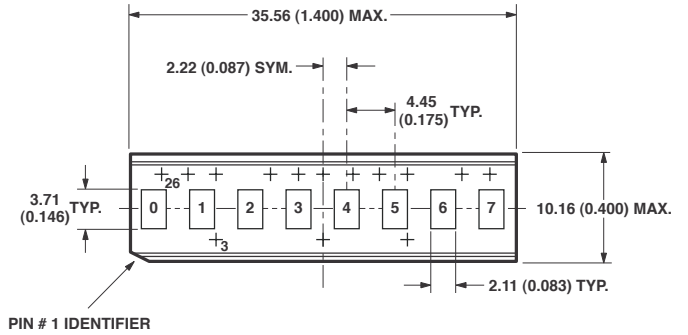
Luminous intensity per LED (Digit Average).

# LED Indicators and Displays

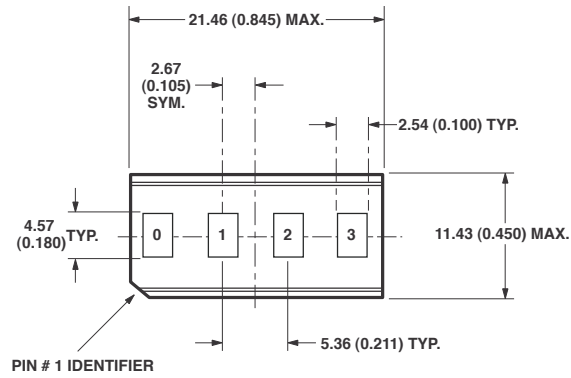
## LED Dot Matrix Smart Displays Package Dimension Drawings



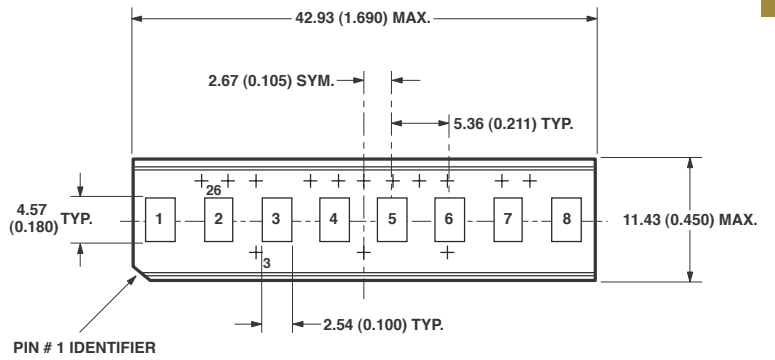
HCMS-290x/HCMS-390x



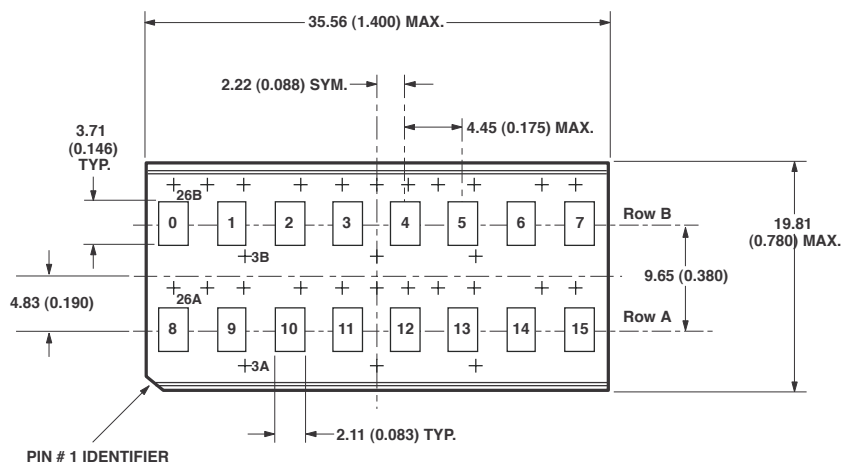
HCMS-291x/HCMS-391x



HCMS-296x/HCMS-396x



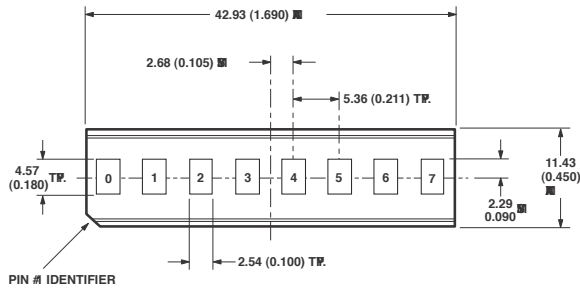
HCMS-297x/HCMS-397x



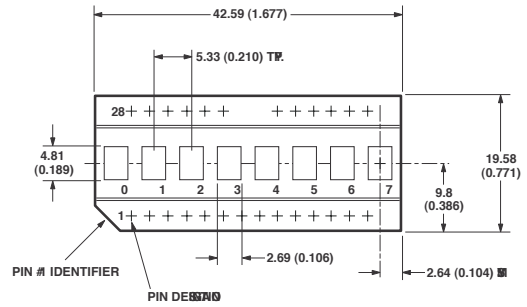
HCMS-292x

DIMENSIONS ARE IN MILLIMETERS (INCHES)

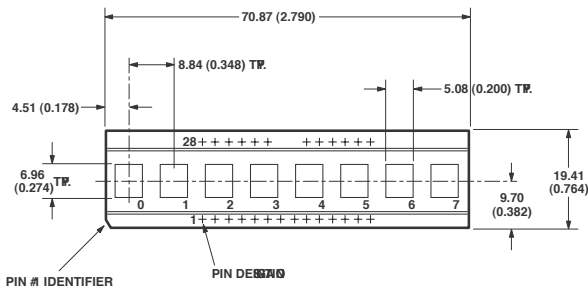
# LED Indicators and Displays



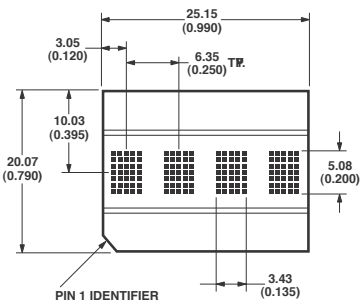
HDSP-253x



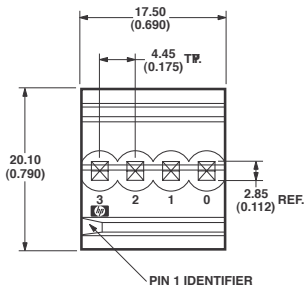
HDSP-2107, -211x



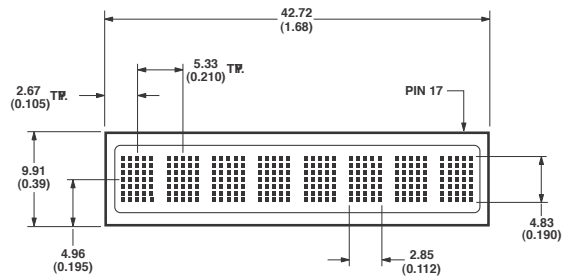
HDSP-250x



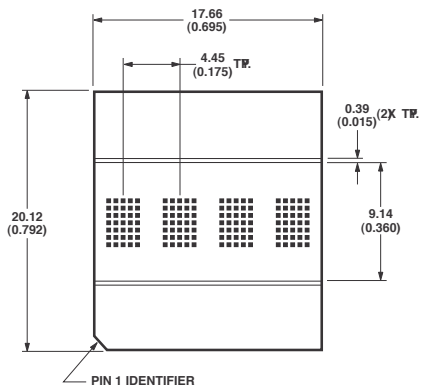
HDLx-2416



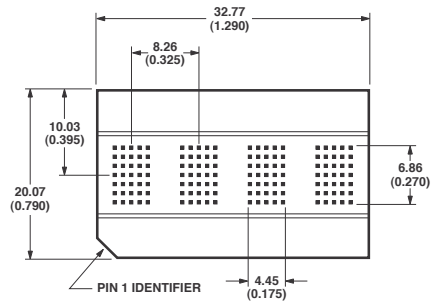
HPDL-1414



HDSP-213x, -2179



HDLx-1414



HDLx-3416

DIMENSIONS ARE IN MILLIMETERS (INCHES)



# Color Management Solutions



## Color Management Solutions

### Description

RGB LEDs are not widely used today for backlighting due to a number of reasons, including cost, different rates of color degradation, wavelength shifts with temperature variations, etc.

Avago Technologies' Illumination and Color Management patented closed feedback system addresses these problems. This system is able to compensate for different degradation rates in RGB LED and maintain an accurate color point. It has two important features: dynamic RGB tuning and dynamic color changing.

### Features and Benefits

- Richer Colors
  - RGB LEDs offer the widest color gamut compared against CCFL backlighting (exceeds 100% of the NTSC color gamut)
- Intensity Control
  - Offers virtually constant brightness over life
- Longer Light Source Lifetime
  - RGB LED lifetime is about 4 times that of CCFL technology
- Panel to Panel Consistency
  - Consistency across multiple panel using a tunable white point
- Wide Choice of Colors
  - Allows customers to customize and change colors easily. Millions of different colors can be created with ease.
- Environmentally Friendly
  - Mercury Free

### Typical Applications and Target Markets

- LCD display backlighting (TVs, automotive monitors, mobile appliances, etc.)
- Industrial – hand-held LCD devices
- Automotive interior
- Architecture lighting
- Home appliances (small LCD screen on freezers, refrigerators, etc.)
- Channel Lettering

# Color Management Solutions

## Device Selection Guide

### Solutions for large screen displays (above 12")

Bundle Part consists of the following specific color controller and color sensor

Bundle Part Number	Color Controller	Color Sensor
HDJD-JB01-8831A	HDJD-J822-SCR00	HDJD-S831-QT333
HDJD-JB01-8835A	HDJD-J822-SCR00	HDJD-S833-QT333

### Color Controller

Part Number	Output Channel	Package Type	Supply Voltage (Typ.)	Operating Temperature	Interface	Input Color Format	Package Dimension
HDJD-J822-SCR00	3 channel, 12 bit RGB PWM output	SOIC	5.0 V	-40°C to 85°C	100 kHz serial interface	CIE XYZ, Yxy, Y u'v' and RGB	Figure 1

### Color Sensor

Part Number	Output Channel	Package Type & Size (mm)	Supply Voltage (Typ.)	Operating Temperature	Max Output voltage swing/ resolution	Responsivity (V/mW/cm <sup>2</sup> )	Spectral Response (nm)	Package Dimension
HDJD-S831-QT333	RGB	Module 27.6x7x3	5.0 V	-20°C to 85°C	3.0 V	R: 1.1 G: 3.9 B: 3.1	400 nm to 700 nm	Figure 2
HDJD-S833-QT333	RGB	Module 27.6x7x3	5.0 V	-20°C to 85°C	3.0 V	R: 2.41 G: 4.88 B: 3.68	400 nm to 700 nm	Figure 3

### Solution for small screen displays (below 10")

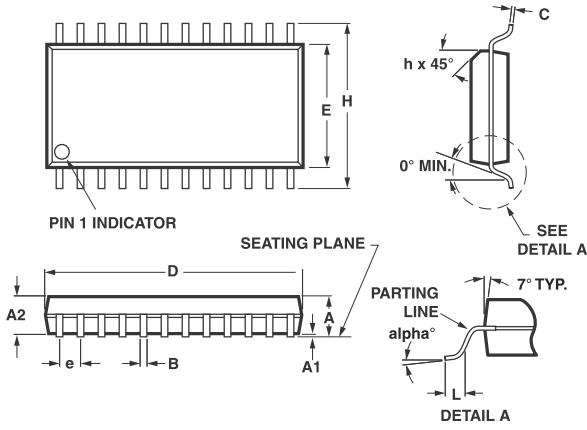
#### Color Management Controller with Integrated RGB Photosensor

Part Number	Output Channel	Package Type & Size (mm)	Supply Voltage (Typ.)	Operating Temperature	Interface	Input Color Format	Sensor Operating Detection Range	Package Dimension
ADJD-J823	3 channel, 12 bit RGB PWM output	QFN 5x5x0.75	2.6 V	0°C to 70°C	100kHz serial interface	CIE Yxy	800-10000 Lux	Figure 4

# Color Management Solutions

## Package Dimensions

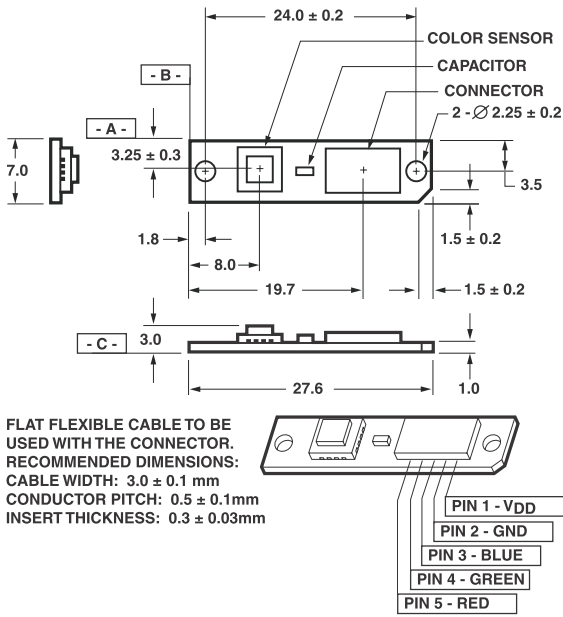
Figure 1



Dimensions in inches

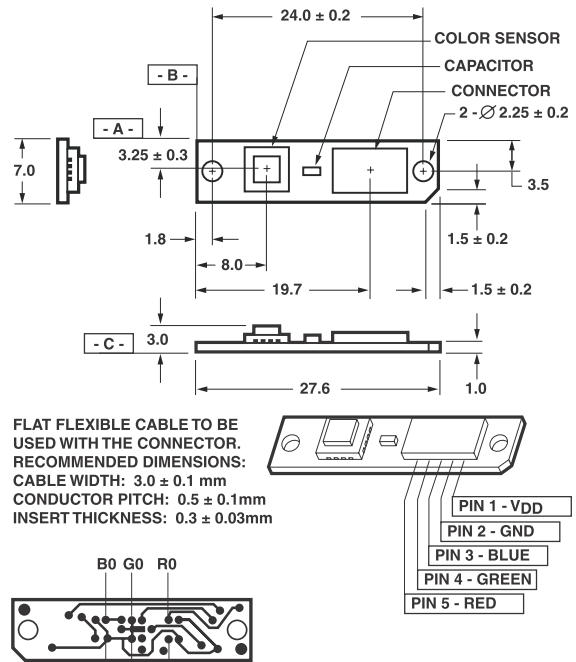
Symbol	Min.	Nom.	Max.
A	0.093	0.099	0.104
A1	0.004	0.008	0.012
A2	0.088	0.094	0.100
B	0.013	0.016	0.020
C	0.0090	0.0100	0.0125
D	0.599	0.606	0.613
E	0.292	0.296	0.299
e	0.050 BSC.		
H	0.394	0.402	0.419
h	0.010	0.015	0.019
L	0.016	0.033	0.050
alpha	0°	5°	8°

Figure 2



FLAT FLEXIBLE CABLE TO BE USED WITH THE CONNECTOR. RECOMMENDED DIMENSIONS: CABLE WIDTH: 3.0 ± 0.1 mm CONDUCTOR PITCH: 0.5 ± 0.1 mm INSERT THICKNESS: 0.3 ± 0.03 mm

Figure 3



FLAT FLEXIBLE CABLE TO BE USED WITH THE CONNECTOR. RECOMMENDED DIMENSIONS: CABLE WIDTH: 3.0 ± 0.1 mm CONDUCTOR PITCH: 0.5 ± 0.1 mm INSERT THICKNESS: 0.3 ± 0.03 mm

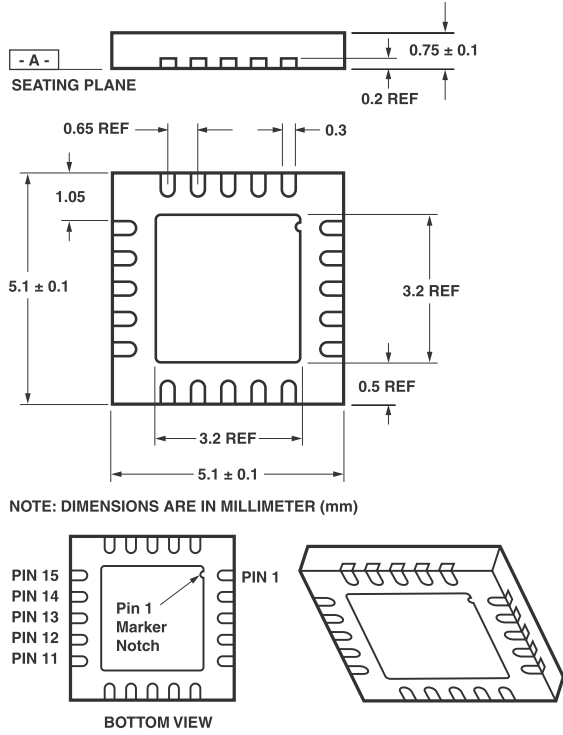
NOTE:  
BACK VIEW OF PCB  
SHORT THE 2 PADS WITH JUMPER FOR 0;  
LEAVE THE 2 PADS OPEN FOR 1.  
DEFAULT GAIN SELECTIONS ARE GS:11  
FOR RED, GREEN AND BLUE.  
REFER TO GAIN SELECTION FEEDBACK  
RESISTOR TABLE ON PAGE 8.

NOTES:  
1. DIMENSIONS ARE IN MILLIMETERS (mm).  
2. UNLESS OTHERWISE SPECIFIED ± 0.3 mm  
TOLERANCE IS APPLICABLE.

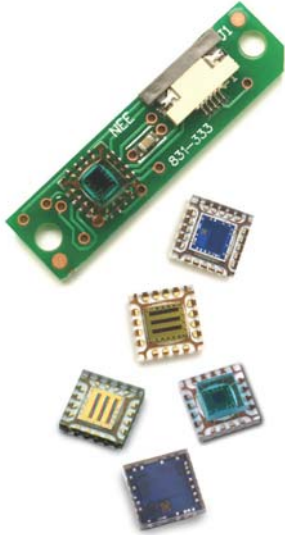
# Color Management Solutions

## Package Dimensions

Figure 4



# Color Sensing Solutions



## Color Sensing Solutions

### Color Sensors

As a leader in sensing and optoelectronic technologies, Avago Technologies provides a broad range of color sensing products to suit the diversified range of applications in industrial, medical, consumer and automotive segments. Products are available in both analog and digital formats. Avago RGB Color Sensor can be used as color detection and measurement as well as in reflective mode with a white LED. Such applications are available in medical and portable devices to perform color identification, color change monitoring, color matching or sorting, as well as in industrial applications such as color label checking, packaging inspection and color control in liquid/object. Avago color sensors are ideal for open-loop color detection and in closed-loop color point control to control the color of the light source. Avago Technologies color sensors provide high-performance, small form factor and cost-effective solutions to color sensing technology.

For applications that require cost-effective solutions and short design cycle time, Avago Technologies' integrated RGB color sensor solutions overcome the inherent challenges of designing color sensors from scratch. Avago Technologies also provides photodiode level solutions to serve customers who prefer to design their own color sensing systems. By offering a broad range of cost-effective, robust packages and lead-free color sensor products, covering the simplest photodiode to the highly integrated digital color sensor, Avago Technologies serves as a one-stop center in the color sensing industry.

### Product Features and Target Applications

#### Analogues RGB Color Sensor

- An array of photodiodes coated with RGB filters with integrated transimpedance amplifier delivering linear analog voltage output
- Independent gain selection options for each R, G, B channel
- Suitable for color measurement, detection or identification for industrial and medical applications
- Potential applications include optical closed-loop color point control for lighting and backlighting applications in the automotive segment

#### Digital RGB Color Sensor

- An array of photodiodes coated with RGB filters with integrated analog-to-digital converters and a digital core for communication via 2-wire serial interface
- Direct interface to microcontroller or other logic control
- Software programmable gain and sensitivity control
- Low power consumption and miniature package that is suitable for portable device applications
- Can be used together with a white LED for reflective color sensing

#### Development Kit

The RGB color sensor development kit is a simple "plug-and-play" solution for color detection and measurement. It comes with easy installation procedures that is comprised of a color sensing module, color reader board and software that processes and converts the sensor's signal output to various forms, (for instance, color coordinates in several different types of color spaces. The development kit is used to demonstrate the principle of color sensing in reflective and transmissive context. It could also provide an easy-to-use solution to the customer that helps accelerate their evaluation).

# Color Sensing Solutions

## Device Selection Guide

Device	Output Channel	Output Type	Package Type & Size (mm)	Supply Voltage (Typ.)	Operating Temperature (Absolute Maximum Rating)	Max Output Voltage Swing/Resolution	Responsivity		Spectral Response (nm)	Target Market	Development Kit
HDJD-S831-QT333	RGB	Analog	Module 27.6x7x3	5.0V	-20°C to 85°C	3.0V	R: 3.1 G: 3.9 B: 1.1	V/ (mW/ cm <sup>2</sup> )	400nm to 700nm	Industrial	–
HDJD-S722-QR999	RGB	Analog	QFN 5x5x1	5.0V	-40°C to 85°C	4.7V	R: 27.0 G: 19.0 B: 15.0	V/ (mW/ cm <sup>2</sup> )	400nm to 700nm	Industrial & Medical	HDJD-JD02
ADJD-E622-QR999	RGB	Analog	QFN 5x5x0.75	5.0V	-40°C to 85°C (Automotive-grade, AEC-Q100)	4.7V	R: 27.0 G: 19.0 B: 13.0	V/ (mW/ cm <sup>2</sup> )	400nm to 700nm	Automotive & Industrial	HDJD-JD06
ADJD-S312-QR999	RGB	Digital	3x3x0.77	2.6V	0°C to 70°C	7 bit resolution	R: 1150 G: 1640 B: 2310	LSB/ (mW/ cm <sup>2</sup> )	400nm to 700nm	Consumer & Medical	–
ADJD-S313-QR999	RGB	Digital	QFN 5x5x0.75	2.6V	0°C to 70°C	7 bit resolution	R: 2490 G: 1750 B: 1250	LSB/ (mW/ cm <sup>2</sup> )	400nm to 700nm	Consumer & Medical	HDJD-JD05

# Color Sensing Solutions

## Device Selection Guide

Device	Package Type	Package Dimension
HDJD-S831-QT333	Module	<p>           COLOR SENSOR            CAPACITOR            CONNECTOR            2-<math>\varnothing</math> 2.25 <math>\pm</math> 0.2         </p> <p>           - A -            7.0            3.25 <math>\pm</math> 0.3            1.8            8.0            19.7            1.5 <math>\pm</math> 0.2            1.5 <math>\pm</math> 0.2            - B -            24.0 <math>\pm</math> 0.2            - C -            3.0            27.6            1.0         </p> <p>           FLAT FLEXIBLE CABLE TO BE USED WITH THE CONNECTOR.            RECOMMENDED DIMENSIONS:            CABLE WIDTH: 3.0 <math>\pm</math> 0.1 mm            CONDUCTOR PITCH: 0.5 <math>\pm</math> 0.1 mm            INSERT THICKNESS: 0.3 <math>\pm</math> 0.03 mm         </p>
HDJD-S722-QR999	QFN	<p>           (0.8)            (0.3)            5.0 <math>\pm</math> 0.15            (3.2)            (3.2)            5.0 <math>\pm</math> 0.15            1.0 <math>\pm</math> 0.15            5 6 7 8            4 9            3 10            2 11            1 12            16 15 14 13            BOTTOM VIEW         </p>
ADJD-E622-QR999	QFN	<p>           0.8 REF            0.30 <math>\pm</math> 0.05            5.0 <math>\pm</math> 0.15            3.2 REF            3.2 REF            5.0 <math>\pm</math> 0.1            0.2 REF            0.75 <math>\pm</math> 0.10            5 6 7 8            4 9            3 10            2 11            1 12            16 15 14 13         </p>
ADJD-S313-QR999	QFN	<p>           - A -            SEATING PLANE            0.75 <math>\pm</math> 0.1            0.2 REF            0.65 REF            0.30            1.05            5.0 <math>\pm</math> 0.15            3.2 REF            3.2 REF            5.0 <math>\pm</math> 0.1            0.5 REF         </p>

## About Avago Technologies

Avago Technologies is a leading supplier of innovative semiconductor solutions for advanced communications, industrial and commercial applications. With a global employee presence, Avago provides an extensive range of analog, mixed-signal and optoelectronic components and subsystems to more than 40,000 customers. The company's products serve four end markets: industrial and automotive, wired infrastructure, wireless communications, and computer peripherals. It is recognized for providing high-quality products along with strong customer service and the industry's best on-time delivery. Avago's heritage of technical innovation dates back 40 years to its Agilent/Hewlett-Packard roots. Information about Avago is available on the Web at [www.avagotech.com](http://www.avagotech.com).

---

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

**[www.avagotech.com](http://www.avagotech.com)**  
**[www.avagotech.com/led](http://www.avagotech.com/led)**

Avago, Avago Technologies, and the A logo are trademarks of Avago Technologies Limited in the United States and other countries.  
Data subject to change. Copyright © 2007 Avago Technologies Limited. Obsoletes 5989-3958EN  
AV00-0112EN 02/22/07

**AVAGO**  
TECHNOLOGIES