



# Agilent HDSP-301x/303x Series HDSP-561x/563x Series 10 mm and 13 mm Slim Font Seven Segment Displays Data Sheet



## Description

These slim font seven segment displays incorporate a new slim font character design. This slim font features narrow width, specially mitered segments to give a fuller appearance to the illuminated character. Faces of these displays are painted a neutral gray for enhanced on/off contrast.

All devices are available in either common anode or common cathode configuration with right hand decimal point.

## Features

- **Excellent appearance**
- **Slim font design**
- **Mitered corners, evenly illuminated segments**
- **Gray face for optimum on/off contrast**
- **Choice of colors: HER, green, yellow, and AlGaAs**
- **Choice of character size: 10 mm and 13 mm**
- **Characterized for luminous intensity**

## Devices

| <b>HER HDSP-</b> | <b>Green HDSP-</b> | <b>Yellow HDSP-</b> | <b>AlGaAs HDSP-</b> | <b>Description</b>            |
|------------------|--------------------|---------------------|---------------------|-------------------------------|
| 301E             | 301G               | 301Y                | 301A                | Common Anode, 10 mm Display   |
| 303E             | 303G               | 303Y                | 303A                | Common Cathode, 10 mm Display |
| 561E             | 561G               | 561Y                | 561A                | Common Anode, 13 mm Display   |
| 563E             | 563G               | 563Y                | 563A                | Common Cathode, 13 mm Display |



## Part Numbering System

5082 - x xx x - x x x xx

HDSP - x xx x - x x x xx



### Notes:

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

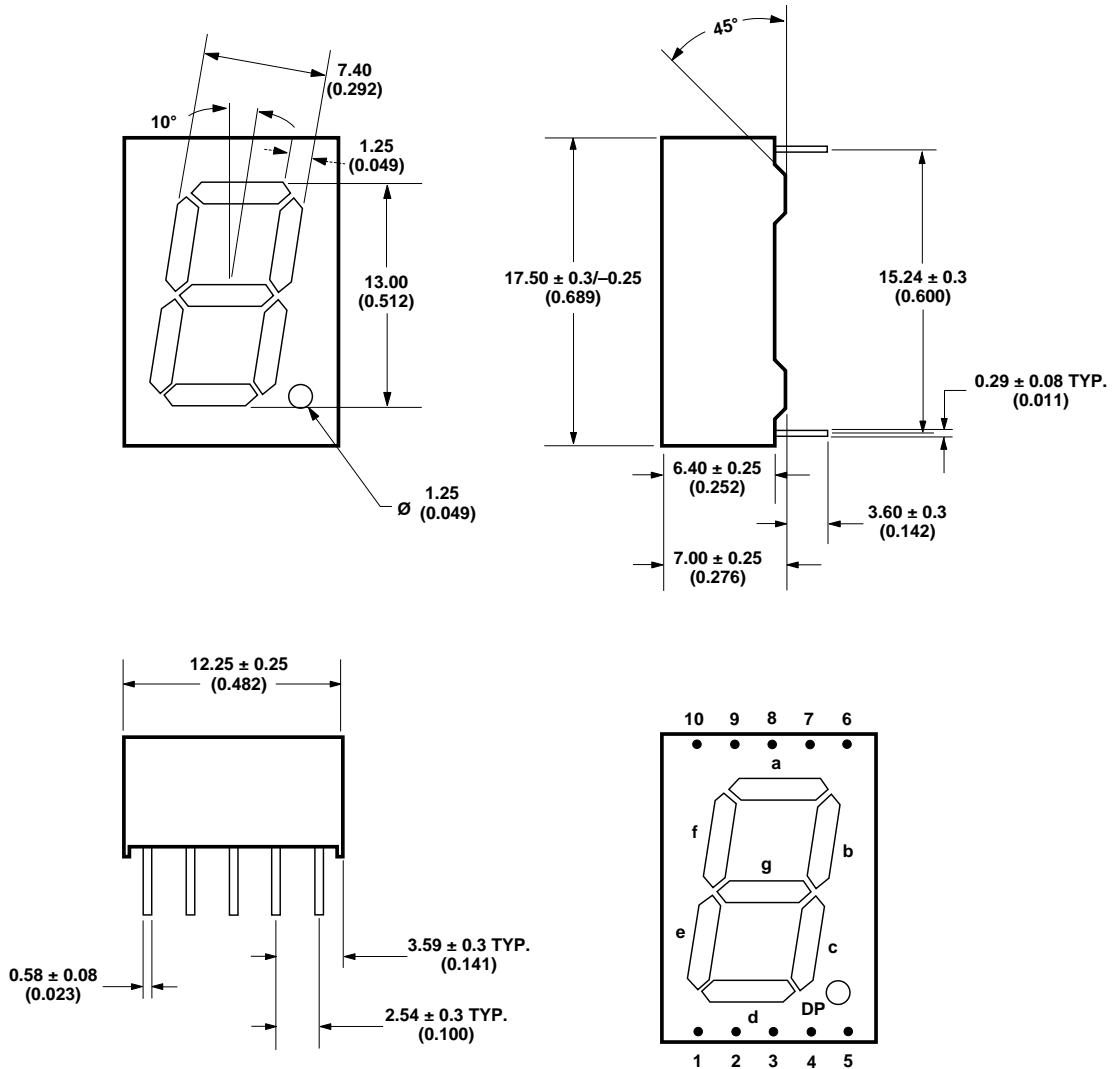
**HDSP-301x/303x Series**



**NOTE: QDSP-399G DOES NOT HAVE PIN 6.**

| Pin | Function   |
|-----|------------|
| 1   | G          |
| 2   | F          |
| 3   | Common A/C |
| 4   | E          |
| 5   | D          |
| 6   | DP         |
| 7   | C          |
| 8   | Common A/C |
| 9   | B          |
| 10  | A          |

# HDSP-561x/563x Series



**NOTES:**  
 1. ALL DIMENSIONS ARE IN MILLIMETERS (INCHES).  
 2. UNLESS OTHERWISE STATED, TOLERANCES ARE  $\pm 0.25$  mm.

| Pin | Function   |
|-----|------------|
| 1   | E          |
| 2   | D          |
| 3   | Common A/C |
| 4   | C          |
| 5   | DP         |
| 6   | B          |
| 7   | A          |
| 8   | Common A/C |
| 9   | F          |
| 10  | G          |

### Absolute Maximum Ratings

| Description   | HER        | Green      | Yellow     | AlGaAs     | Units |
|---|------------|------------|------------|------------|-------|
| Average Power per Segment or DP                               | 105        | 105        | 105        | 37         | mW    |
| Peak Forward Current per Segment or DP                        | 90         | 90         | 90         | 45         | mA    |
| DC Forward Current per Segment or DP                          | 30         | 30         | 30         | 15         | mA    |
| Operating Temperature Range                                   | -40 to +80 | -40 to +80 | -40 to +80 | -20 to +80 | °C    |
| Storage Temperature Range                                     | -40 to +80 | -40 to +80 | -40 to +80 | -40 to +80 | °C    |
| Reverse Voltage per Segment or DP                             | 5          | 5          | 5          | 5          | V     |
| Wavesoldering Temperature for 3 Seconds<br>1.59 mm below body | 250        | 250        | 250        | 250        | °C    |

#### Notes:

1. Derate above 33°C at 0.34 mA/°C for HER.
2. Derate above 27°C at 0.32 mA/°C for Green.
3. Derate above 30°C at 0.33 mA/°C for Yellow.
4. Derate above 60°C at 0.25 mA/°C for AlGaAs.

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

#### HER

| Device Series | Parameter                                  | Symbol            | Min.  | Typ.  | Max. | Units         | Test Conditions      |
|---------------|--|-------------------|-------|-------|------|---------------|----------------------|
| 301/303E      | Luminous Intensity/Segment (Digit Average) | $I_V$             | 1.251 | 2.000 |      | mcd           | $I_F = 10\text{ mA}$ |
|               | Forward Voltage/Segment or DP              | $V_F$             |       | 1.90  | 2.50 | V             | $I_F = 20\text{ mA}$ |
|               | Peak Wavelength                            | $\lambda_{PEAK}$  |       | 635   |      | nm            | $I_F = 20\text{ mA}$ |
|               | Dominant Wavelength                        | $\lambda_d$       |       | 625   |      | nm            | $I_F = 20\text{ mA}$ |
|               | Reverse Current                            | $I_R$             |       |       | 100  | $\mu\text{A}$ | $V_R = 5\text{ V}$   |
|               | Thermal Resistance LED Junction-to-Pin     | $R\theta_{J-PIN}$ |       | 351.5 |      | °C/W/Seg.     |                      |

#### HER

| Device Series | Parameter                                  | Symbol            | Min.  | Typ.  | Max. | Units         | Test Conditions      |
|---------------|--|-------------------|-------|-------|------|---------------|----------------------|
| 561/563E      | Luminous Intensity/Segment (Digit Average) | $I_V$             | 2.001 | 3.526 |      | mcd           | $I_F = 10\text{ mA}$ |
|               | Forward Voltage/Segment or DP              | $V_F$             |       | 1.90  | 2.50 | V             | $I_F = 20\text{ mA}$ |
|               | Peak Wavelength                            | $\lambda_{PEAK}$  |       | 635   |      | nm            | $I_F = 20\text{ mA}$ |
|               | Dominant Wavelength                        | $\lambda_d$       |       | 625   |      | nm            | $I_F = 20\text{ mA}$ |
|               | Reverse Current                            | $I_R$             |       |       | 100  | $\mu\text{A}$ | $V_R = 5\text{ V}$   |
|               | Thermal Resistance LED Junction-to-Pin     | $R\theta_{J-PIN}$ |       | 351.5 |      | °C/W/Seg.     |                      |

**Green**

| <b>Device Series</b> |       | <b>Parameter</b>                           | <b>Symbol</b>     | <b>Min.</b> | <b>Typ.</b> | <b>Max.</b> | <b>Units</b> | <b>Test Conditions</b>    |                     |
|----------------------|-------|--|-------------------|-------------|-------------|-------------|--------------|---------------------------|---------------------|
| 301/303G             | HDSP- | Luminous Intensity/Segment (digit average) | $I_V$             | 2.001       | 3.200       |             | mcd          | $I_F = 10 \text{ mA}$     |                     |
|                      |       | Forward Voltage/Segment or DP              | $V_F$             |             | 2.25        | 2.50        | V            | $I_F = 20 \text{ mA}$     |                     |
|                      |       | Peak Wavelength                            | $\lambda_{PEAK}$  |             | 568         |             | nm           | $I_F = 20 \text{ mA}$     |                     |
|                      |       | Dominant Wavelength                        | $\lambda_d$       |             | 573         |             | nm           | $I_F = 20 \text{ mA}$     |                     |
|                      |       | Reverse Current                            | $I_R$             |             |             |             | 100          | $\mu\text{A}$             | $V_R = 5 \text{ V}$ |
|                      |       | Thermal Resistance LED Junction-to-Pin     | $R\theta_{J-PIN}$ |             |             | 351.5       |              | $^{\circ}\text{C/W/Seg.}$ |                     |

**Green**

| <b>Device Series</b> |       | <b>Parameter</b>                           | <b>Symbol</b>     | <b>Min.</b> | <b>Typ.</b> | <b>Max.</b> | <b>Units</b> | <b>Test Conditions</b>    |                     |
|----------------------|-------|--|-------------------|-------------|-------------|-------------|--------------|---------------------------|---------------------|
| 561/563G             | HDSP- | Luminous Intensity/Segment (Digit Average) | $I_V$             | 3.201       | 5.601       |             | mcd          | $I_F = 10 \text{ mA}$     |                     |
|                      |       | Forward Voltage/Segment or DP              | $V_F$             |             | 2.25        | 2.50        | V            | $I_F = 20 \text{ mA}$     |                     |
|                      |       | Peak Wavelength                            | $\lambda_{PEAK}$  |             | 568         |             | nm           | $I_F = 20 \text{ mA}$     |                     |
|                      |       | Dominant Wavelength                        | $\lambda_d$       |             | 573         |             | nm           | $I_F = 20 \text{ mA}$     |                     |
|                      |       | Reverse Current                            | $I_R$             |             |             |             | 100          | $\mu\text{A}$             | $V_R = 5 \text{ V}$ |
|                      |       | Thermal Resistance LED Junction-to-Pin     | $R\theta_{J-PIN}$ |             |             | 351.5       |              | $^{\circ}\text{C/W/Seg.}$ |                     |

**Yellow**

| <b>Device Series</b> |       | <b>Parameter</b>                           | <b>Symbol</b>     | <b>Min.</b> | <b>Typ.</b> | <b>Max.</b> | <b>Units</b> | <b>Test Conditions</b>    |                     |
|----------------------|-------|--|-------------------|-------------|-------------|-------------|--------------|---------------------------|---------------------|
| 301/303Y             | HDSP- | Luminous Intensity/Segment (Digit Average) | $I_V$             | 1.251       | 2.000       |             | mcd          | $I_F = 10 \text{ mA}$     |                     |
|                      |       | Forward Voltage/Segment or DP              | $V_F$             |             | 2.15        | 2.50        | V            | $I_F = 20 \text{ mA}$     |                     |
|                      |       | Peak Wavelength                            | $\lambda_{PEAK}$  |             | 589         |             | nm           | $I_F = 20 \text{ mA}$     |                     |
|                      |       | Dominant Wavelength                        | $\lambda_d$       |             | 590         |             | nm           | $I_F = 20 \text{ mA}$     |                     |
|                      |       | Reverse Current                            | $I_R$             |             |             |             | 100          | $\mu\text{A}$             | $V_R = 5 \text{ V}$ |
|                      |       | Thermal Resistance LED Junction-to-Pin     | $R\theta_{J-PIN}$ |             |             | 351.5       |              | $^{\circ}\text{C/W/Seg.}$ |                     |

## Yellow

| Device Series | Parameter                                  | Symbol             | Min. | Typ.  | Max. | Units                     | Test Conditions       |
|---------------|--|--------------------|------|-------|------|---------------------------|-----------------------|
| HDSP-561/563Y | Luminous Intensity/Segment (Digit Average) | $I_V$              | 2.00 | 3.526 |      | mcd                       | $I_F = 10 \text{ mA}$ |
|               | Forward Voltage/Segment or DP              | $V_F$              |      | 2.15  | 2.50 | V                         | $I_F = 20 \text{ mA}$ |
|               | Peak Wavelength                            | $\lambda_{PEAK}$   |      | 589   |      | nm                        | $I_F = 20 \text{ mA}$ |
|               | Dominant Wavelength                        | $\lambda_d$        |      | 590   |      | nm                        | $I_F = 20 \text{ mA}$ |
|               | Reverse Current                            | $I_R$              |      |       | 100  | $\mu\text{A}$             | $V_R = 5 \text{ V}$   |
|               | Thermal Resistance LED Junction-to-Pin     | $R_{\theta J-PIN}$ |      | 351.5 |      | $^{\circ}\text{C/W/Seg.}$ |                       |

### Notes:

1. Typical specification for reference only. Do not exceed absolute maximum ratings.
2. The dominant wavelength,  $\lambda$ , is derived from the CIE chromaticity diagram and is that single wavelength which defines the color of the device.

## AlGaAs

| Device Series | Parameter                                  | Symbol             | Min.  | Typ.  | Max. | Units                     | Test Conditions       |
|---------------|--|--------------------|-------|-------|------|---------------------------|-----------------------|
| HDSP-301/303A | Luminous Intensity/Segment (Digit Average) | $I_V$              | 0.320 | 0.505 |      | mcd                       | $I_F = 1 \text{ mA}$  |
|               | Forward Voltage/Segment or DP              | $V_F$              |       | 1.80  | 2.20 | V                         | $I_F = 20 \text{ mA}$ |
|               | Peak Wavelength                            | $\lambda_{PEAK}$   |       | 660   |      | nm                        | $I_F = 20 \text{ mA}$ |
|               | Dominant Wavelength                        | $\lambda_d$        |       | 643   |      | nm                        | $I_F = 20 \text{ mA}$ |
|               | Reverse Current                            | $I_R$              |       |       | 100  | $\mu\text{A}$             | $V_R = 5 \text{ V}$   |
|               | Thermal Resistance LED Junction-to-Pin     | $R_{\theta J-PIN}$ |       | 351.5 |      | $^{\circ}\text{C/W/Seg.}$ |                       |

## AlGaAs

| Device Series | Parameter                                  | Symbol             | Min.  | Typ.  | Max. | Units                     | Test Conditions       |
|---------------|--|--------------------|-------|-------|------|---------------------------|-----------------------|
| HDSP-561/563A | Luminous Intensity/Segment (Digit Average) | $I_V$              | 0.506 | 0.878 |      | mcd                       | $I_F = 1 \text{ mA}$  |
|               | Forward Voltage/Segment or DP              | $V_F$              |       | 1.80  | 2.20 | V                         | $I_F = 20 \text{ mA}$ |
|               | Peak Wavelength                            | $\lambda_{PEAK}$   |       | 660   |      | nm                        | $I_F = 20 \text{ mA}$ |
|               | Dominant Wavelength                        | $\lambda_d$        |       | 643   |      | nm                        | $I_F = 20 \text{ mA}$ |
|               | Reverse Current                            | $I_R$              |       |       | 100  | $\mu\text{A}$             | $V_R = 5 \text{ V}$   |
|               | Thermal Resistance LED Junction-to-Pin     | $R_{\theta J-PIN}$ |       | 351.5 |      | $^{\circ}\text{C/W/Seg.}$ |                       |

### Notes:

1. Typical specification for reference only. Do not exceed absolute maximum ratings.
2. The dominant wavelength,  $\lambda$ , is derived from the CIE chromaticity diagram and is that single wavelength which defines the color of the device.

## Intensity Bin Limits (mcd)

### Green

| HDSP-301G/303G/561G/563G |       |       |
|--------------------------|-------|-------|
| IV Bin Category          | Min.  | Max.  |
| K                        | 1.800 | 3.600 |
| L                        | 2.800 | 5.600 |

### Yellow

| HDSP-301Y/303Y  |       |       |
|-----------------|-------|-------|
| IV Bin Category | Min.  | Max.  |
| I               | 1.100 | 2.200 |
| K               | 1.800 | 3.600 |

### Yellow

| HDSP-561Y/563Y  |       |       |
|-----------------|-------|-------|
| IV Bin Category | Min.  | Max.  |
| K               | 1.800 | 3.600 |
| L               | 2.800 | 5.600 |

### HER

| HDSP-301E/303E/561E/563E |       |       |
|--------------------------|-------|-------|
| IV Bin Category          | Min.  | Max.  |
| I                        | 1.100 | 2.200 |
| K                        | 1.800 | 3.600 |

### AlGaAs Red

| HDSP-301A/303A/561A/563A |       |       |
|--------------------------|-------|-------|
| IV Bin Category          | Min.  | Max.  |
| F                        | 0.280 | 0.560 |
| G                        | 0.450 | 0.900 |

## Color Categories

| Color  | Bin | Dominant Wavelength (nm) |        |
|--------|-----|--------------------------|--------|
|        |     | Min.                     | Max.   |
| Green  | 3   | 570.00                   | 574.50 |
|        | 4   | 567.00                   | 571.50 |
| Yellow | 2   | 586.50                   | 590.00 |
|        | 3   | 584.00                   | 587.50 |

### Note:

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



## HDSP-301x/303x Series



Figure 1. Maximum allowable DC current vs. ambient temperature.



Figure 2. Forward current vs. forward voltage.



Figure 3. Relative luminous intensity vs. DC forward current.

## HDSP-561x/563x Series



Figure 4. Maximum allowable DC current vs. ambient temperature.



Figure 5. Forward current vs. forward voltage.



Figure 6. Relative luminous intensity vs. DC forward current.

### Contrast Enhancement

For information on contrast enhancement, please see Application Note 1015.

### Soldering/Cleaning

Cleaning agents from the ketone family (acetone, methyl ethyl ketone, etc.) and from the chlorinated hydrocarbon family (methylene chloride,

trichloroethylene, carbon tetrachloride, etc.) are not recommended for cleaning LED parts. All of these various solvents attack or dissolve the encapsulating epoxies used to form the package of plastic LED parts.

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

**[www.agilent.com/semiconductors](http://www.agilent.com/semiconductors)**

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

For technical assistance call:

Americas/Canada: +1 (800) 235-0312 or  
(916) 788-6763

Europe: +49 (0) 6441 92460

China: 10800 650 0017

Hong Kong: (+65) 6756 2394

India, Australia, New Zealand: (+65) 6755 1939

Japan: (+81 3) 3335-8152(Domestic/  
International), or 0120-61-1280(Domestic Only)

Korea: (+65) 6755 1989

Singapore, Malaysia, Vietnam, Thailand,  
Philippines, Indonesia: (+65) 6755 2044

Taiwan: (+65) 6755 1843

Data subject to change.

Obsoletes 5980-2919EN

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5988-4352EN



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