# HDSP-S5xE/S5xG/B5xZ Series

91.44 mm (3.6 inch) General Purpose 5 x 7 Dot Matrix Alphanumeric Displays

## Data Sheet



### Description

These displays have a 91.44 mm (3.6 inch) character height. The devices are available in either common row anode or common row cathode configurations. The displays come in only black face paint and are available in a choice of GaP Red or GaP Green colors. The Bi-color display consists of GaP Red and GaP Green colors.

These parts are subjected to Outgoing Quality Assurance (OQA) inspection with an AQL of 0.065% for functional and visual/cosmetic defects.

### Applications

- **Suitable for indoor use**
- **Not recommended for industrial applications, i.e. operating temperature requirements exceeding 85°C or below –35°C**
- **Extreme temperature cycling not recommended[1]**

### Features

- **5 x 7 Dot matrix font**
- **Stackable horizontally**
- **Pin-out**
  – 76.2 mm (3.0 in.) Dual-In-Line (DIP) leads on 5.08 mm (0.2 in.) centers
- **Choice of colors**
  – Single color: red or green
  – Bi-color: red and green
- **Face paint color: black**
- **Design flexibility**
  – Common row anode or Common row cathode
- **Categorized:**
  – Single color: luminous intensity
  – Bi-Color: luminance
- **Green categorized for color**

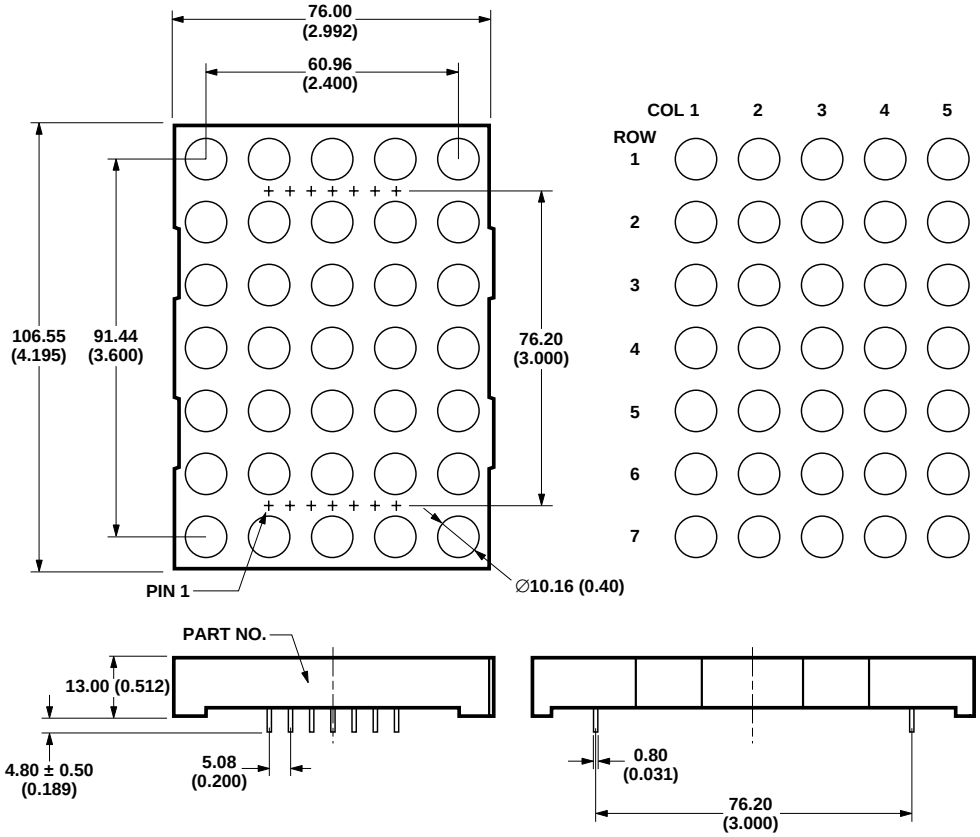
### Devices

| GaP Red HDSP- | GaP Green HDSP- | Description |
|---|---|---|
| S53E | S53G | 91.44 mm Black Surface Common Row Anode |
| S58E | S58G | 91.44 mm Black Surface Common Row Cathode |
| B53Z | | 91.44 mm Black Surface Bi-Color Common Row Anode |
| B58Z | | 91.44 mm Black Surface Bi-Color Common Row Cathode |

**Note:**
1. For details, please contact your local Avago components sales office or an authorized distributor.

**Package Dimensions**

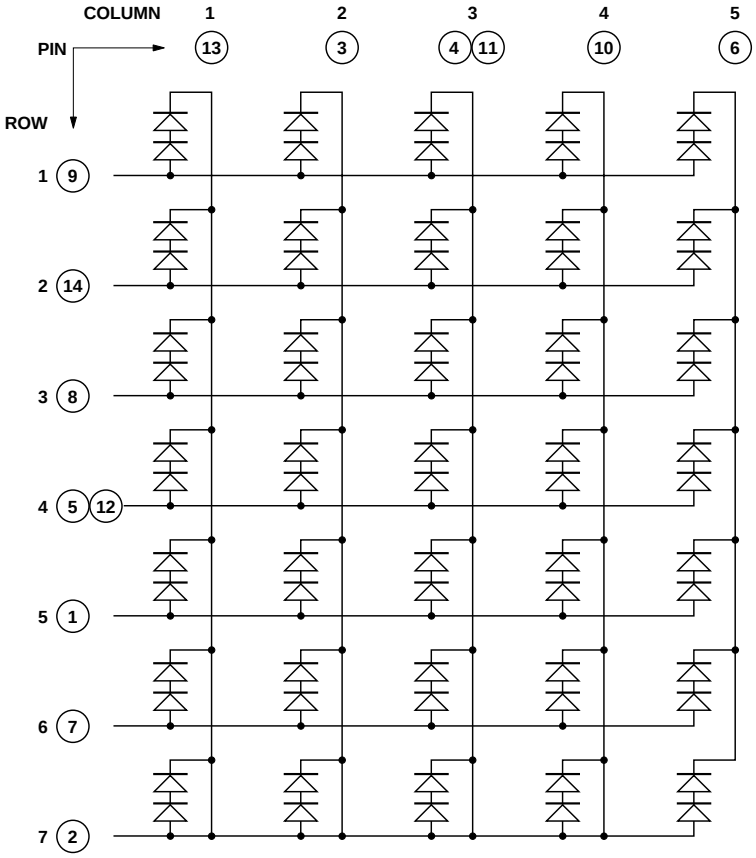
Single Color




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

**Internal Circuit Diagram**

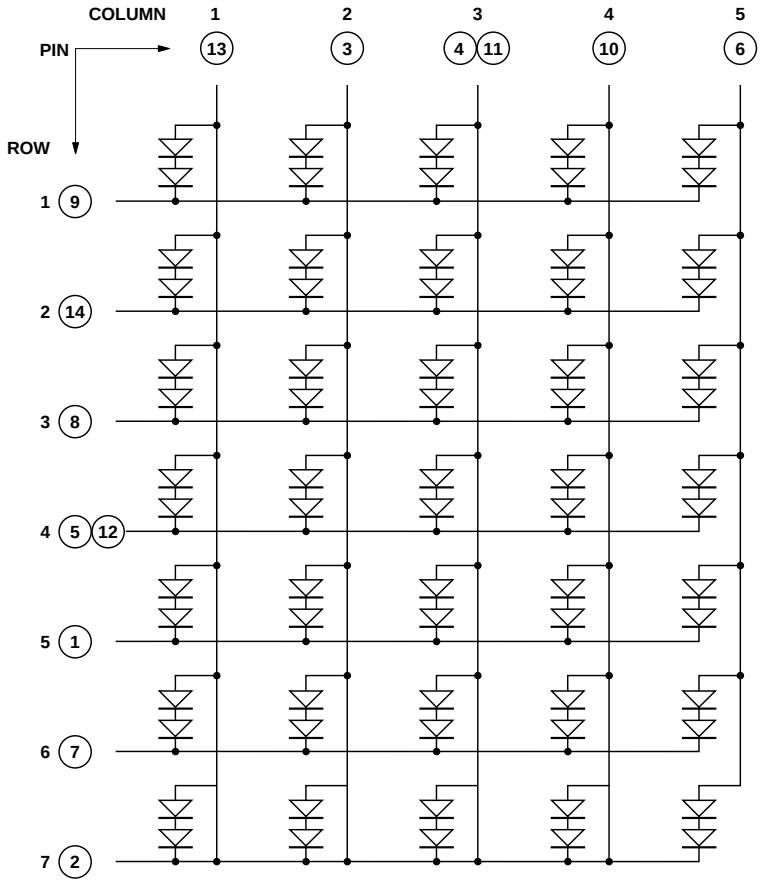
Common Row Anode – Single Color




| PIN NO. | CONNECTION |
|---|---|
| 1 | ANODE ROW 5 |
| 2 | ANODE ROW 7 |
| 3 | CATHODE COLUMN 2 |
| 4 | CATHODE COLUMN 3 |
| 5 | ANODE ROW 4 |
| 6 | CATHODE COLUMN 5 |
| 7 | ANODE ROW 6 |
| 8 | ANODE ROW 3 |
| 9 | ANODE ROW 1 |
| 10 | CATHODE COLUMN 4 |
| 11 | CATHODE COLUMN 3 |
| 12 | ANODE ROW 4 |
| 13 | CATHODE COLUMN 1 |
| 14 | ANODE ROW 2 |

**Internal Circuit Diagram**

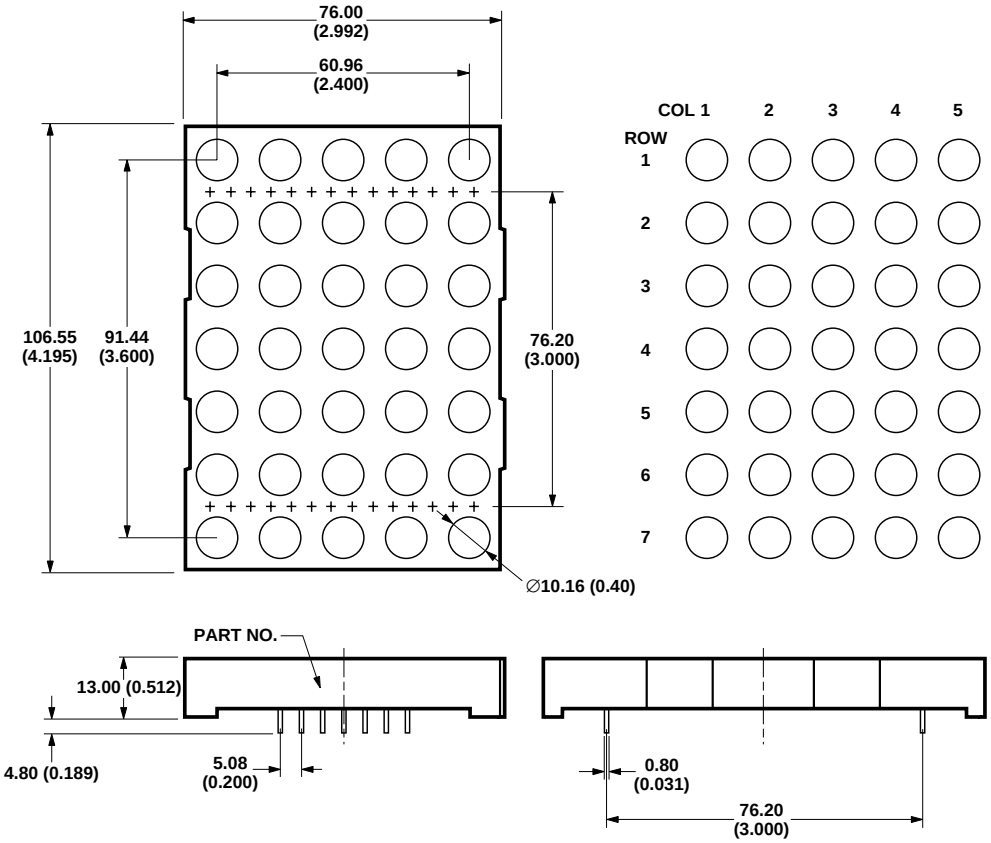
Common Row Cathode – Single Color




| PIN NO. | CONNECTION |
|---|---|
| 1 | CATHODE ROW 5 |
| 2 | CATHODE ROW 7 |
| 3 | ANODE COLUMN 2 |
| 4 | ANODE COLUMN 3 |
| 5 | CATHODE ROW 4 |
| 6 | ANODE COLUMN 5 |
| 7 | CATHODE ROW 6 |
| 8 | CATHODE ROW 3 |
| 9 | CATHODE ROW 1 |
| 10 | ANODE COLUMN 4 |
| 11 | ANODE COLUMN 3 |
| 12 | CATHODE ROW 4 |
| 13 | ANODE COLUMN 1 |
| 14 | CATHODE ROW 2 |

**Package Dimensions**

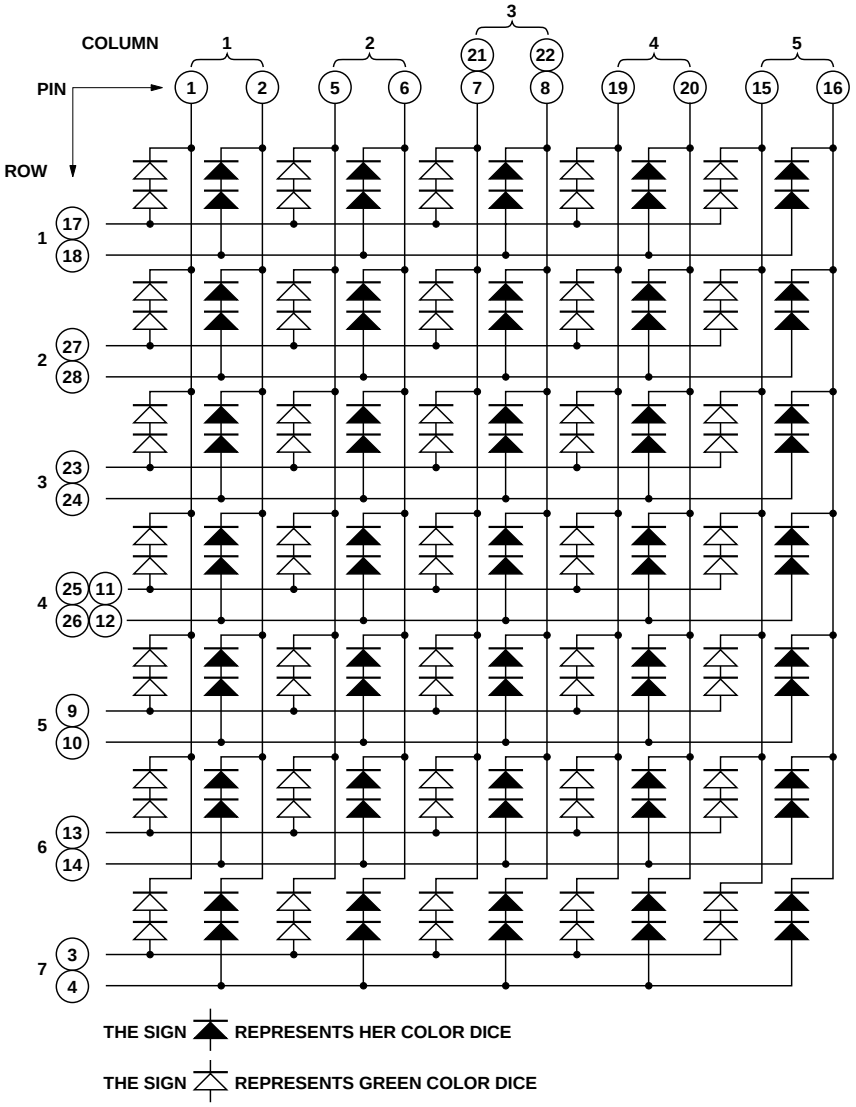
Bi-Color




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

**Internal Circuit Diagram**

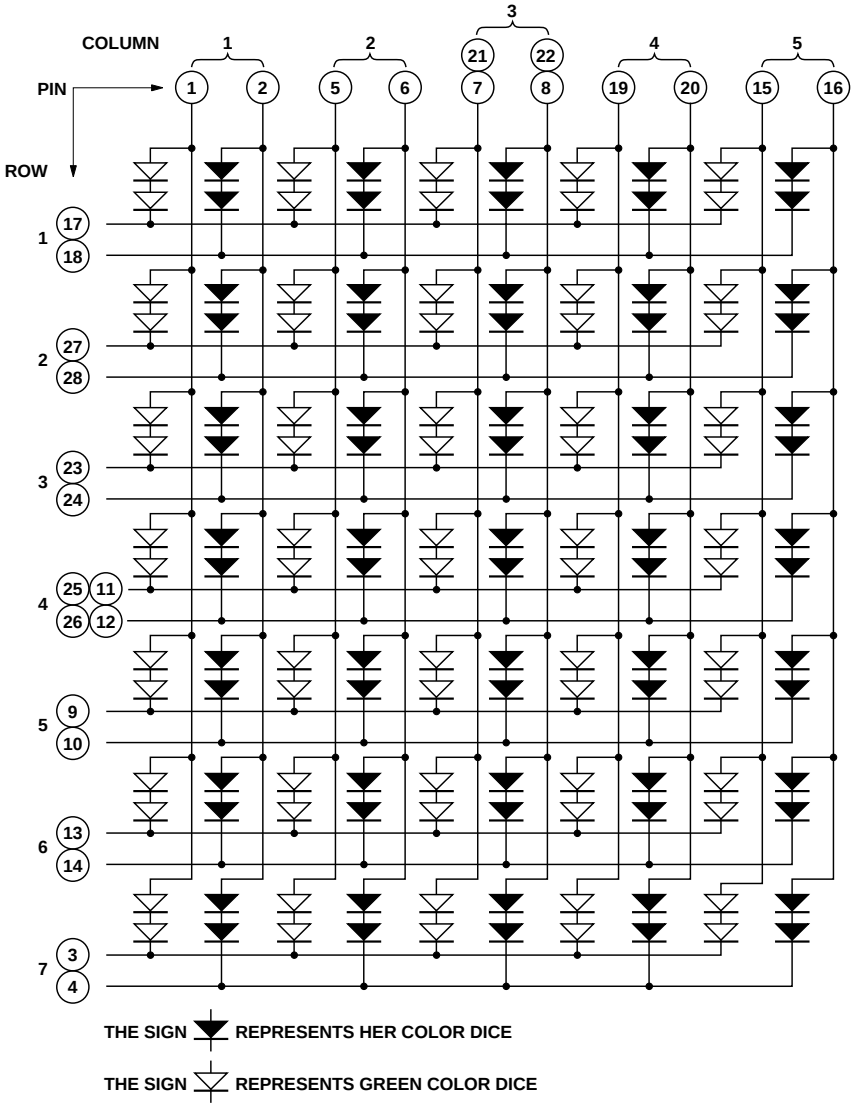
Common Row Anode – Bi-Color




| PIN NO. | CONNECTION |
|---|---|
| 1 | COLUMN 1 GREEN |
| 2 | COLUMN 1 HER |
| 3 | ROW 7 GREEN |
| 4 | ROW 7 HER |
| 5 | COLUMN 2 GREEN |
| 6 | COLUMN 2 HER |
| 7, 21 | COLUMN 3 GREEN |
| 8, 22 | COLUMN 3 HER |
| 9 | ROW 5 GREEN |
| 10 | ROW 5 HER |
| 11, 25 | ROW 4 GREEN |
| 12, 26 | ROW 4 HER |
| 13 | ROW 6 GREEN |
| 14 | COLUMN 6 HER |
| 15 | COLUMN 5 GREEN |
| 16 | COLUMN 5 HER |
| 17 | ROW 1 GREEN |
| 18 | ROW 1 HER |
| 19 | COLUMN 4 GREEN |
| 20 | COLUMN 4 HER |
| 23 | ROW 3 GREEN |
| 24 | ROW 3 HER |
| 27 | ROW 2 GREEN |
| 28 | ROW 2 HER |

**Internal Circuit Diagram**

Common Row Cathode – Bi-Color




| PIN NO. | CONNECTION |
|---|---|
| 1 | COLUMN 1 GREEN |
| 2 | COLUMN 1 HER |
| 3 | ROW 7 GREEN |
| 4 | ROW 7 HER |
| 5 | COLUMN 2 GREEN |
| 6 | COLUMN 2 HER |
| 7, 21 | COLUMN 3 GREEN |
| 8, 22 | COLUMN 3 HER |
| 9 | ROW 5 GREEN |
| 10 | ROW 5 HER |
| 11, 25 | ROW 4 GREEN |
| 12, 26 | ROW 4 HER |
| 13 | ROW 6 GREEN |
| 14 | COLUMN 6 HER |
| 15 | COLUMN 5 GREEN |
| 16 | COLUMN 5 HER |
| 17 | ROW 1 GREEN |
| 18 | ROW 1 HER |
| 19 | COLUMN 4 GREEN |
| 20 | COLUMN 4 HER |
| 23 | ROW 3 GREEN |
| 24 | ROW 3 HER |
| 27 | ROW 2 GREEN |
| 28 | ROW 2 HER |

**Absolute Maximum Ratings at $T_A$ = 25°C**

| Parameter | GaP Red HDSP-S53E / S58E / B53Z / B58Z | GaP Green HDSP-S53G / S58G / B53Z / B58Z | Units |
|---|---|---|---|
| Average Power per Dot[1] | 130 | 130 | mW |
| Peak Forward Current per Dot[1] (1/8 Duty Cycle at 10 KHz) | 80 | 100 | mA |
| Average Forward Current per Dot | 25[1,2] | 25[1,3] | mA |
| Reverse Voltage per Dot | 3 | 3 | V |
| Operating Temperature | –35 to +85 | –35 to +85 | °C |
| Storage Temperature | –35 to +85 | –35 to +85 | °C |
| Wave Soldering Temperature for 3 seconds[4] (2 mm [0.078 in.] below Body) | 250 | 250 | °C |

**Notes:**

1. Do not exceed maximum average current per dot.
2. Derate above 25°C at 0.20 mA/°C.
3. Derate above 25°C at 0.33 mA/°C.
4. Not recommended to be soldered more than 2 times. Minimum interval between solderings is 15 minutes. Total soldering time not to exceed 3 seconds.

**Optical / Electrical Characteristics at $T_A = 25^\circ C$**

**GaP Red**

| Devices HDSP- | Parameter | Symbol | Min. | Typ. | Max. | Units | Test Conditions |
|---|---|---|---|---|---|---|---|
| S53E S58E B53Z B58Z | Luminous Intensity / Unit (Digit Average)[1] | $I_V$ | 2.2 | 4.0 | 7.47 | mcd | $I_{FP}$ = 40 mA, 1/8 Duty Factor |
| | Peak Wavelength | $\lambda_{peak}$ | | 632 | | nm | $I_F$ = 20 mA |
| | Dominant Wavelength[2] | $\lambda_d$ | | 622 | | nm | $I_F$ = 20 mA |
| | Forward Voltage | $V_F$ | | 4.1 | 5.2 | V | $I_F$ = 20 mA |
| | Reverse Voltage[3] | $V_R$ | 3.0 | | | V | $I_R$ = 100 μA |
| | Luminous Intensity Matching Ratio | $I_{V-m}$ | | | 2:1 | | $I_{FP}$ = 40 mA, 1/8 Duty Factor |

**GaP Green**

| Devices HDSP- | Parameter | Symbol | Min. | Typ. | Max. | Units | Test Conditions |
|---|---|---|---|---|---|---|---|
| S53G S58G B53Z B58Z | Luminous Intensity / Unit (Digit Average)[1] | $I_V$ | 3.31 | 6.23 | 11.22 | mcd | $I_{FP}$ = 40 mA, 1/8 Duty Factor |
| | Peak Wavelength | $\lambda_{peak}$ | | 568 | | nm | $I_F$ = 20 mA |
| | Dominant Wavelength[2] | $\lambda_d$ | | 573 | | nm | $I_F$ = 20 mA |
| | Forward Voltage | $V_F$ | | 4.5 | 5.2 | V | $I_F$ = 20 mA |
| | Reverse Voltage[3] | $V_R$ | 3.0 | | | V | $I_R$ = 100 μA |
| | Luminous Intensity Matching Ratio | $I_{V-m}$ | | | 2:1 | | $I_{FP}$ = 40 mA, 1/8 Duty Factor |

**Bi-Color**

| Devices HDSP- | Parameter | Symbol | Min. | Typ. | Max. | Units | Test Conditions |
|---|---|---|---|---|---|---|---|
| B53Z B58Z | Luminance / Unit (Digit Average)[1] | $I_V$ | 72.0 | 130 | 258.0 | $Cd/m^2$ | $I_{FP}$ = 40 mA, 1/8 Duty Factor |

**Notes:**

1. The digits are categorized for luminous intensity or luminance. The intensity or luminance category is designated by a letter on the side of the package.
2. The dominant wavelength, $\lambda_d$, is derived from the CIE chromaticity diagram and represents the single wavelength which defines the color of the device.
3. Typical specification for reference only. Do not exceed absolute maximum ratings.

**Intensity Bin Limits[1] (mcd at $I_{FP}$ = 40 mA, 1 / 8 Duty Factor)**

**GaP Red**

| Bin Name | Min.[2] | Max.[2] |
|---|---|---|
| G | 2.2 | 3.3 |
| H | 3.31 | 4.97 |
| I | 4.98 | 7.47 |

**GaP Green**

| Bin Name | Min.[2] | Max.[2] |
|---|---|---|
| H | 3.31 | 4.97 |
| I | 4.98 | 7.47 |
| J | 7.48 | 11.22 |

**Bi-Color (Cd / $m^2$ at $I_{FP}$ = 40 mA, 1 / 8 Duty Factor)**

| Bin Name | Min.[2] | Max.[2] |
|---|---|---|
| E | 72 | 86 |
| F | 86 | 104 |
| G | 104.1 | 124 |
| H | 124.1 | 149 |
| I | 149.1 | 179 |
| J | 179.1 | 215 |
| K | 215.1 | 258 |

**Hue Grade**

| | Bin | | | | | | |
|---|---|---|---|---|---|---|---|
| Coordinate | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| X | 0.542-0.553 | 0.552-0.563 | 0.562-0.573 | 0.572-0.583 | 0.582-0.593 | 0.592-0.603 | 0.602-0.613 |
| Y | 0.445-0.456 | 0.435-0.446 | 0.425-0.436 | 0.415-0.426 | 0.405-0.416 | 0.395-0.406 | 0.385-0.396 |

**Notes:**
1. Hue categories are established for classification of products. Products may not be available in all bin categories.
2. Tolerance for each intensity bin limit is ± 10%.

**Color Bin Limits (nm)[1]**

**GaP Green**

| Bin Name | Min.[2] | Max.[2] |
|---|---|---|
| 3 | 569.1 | 571 |
| 4 | 571.1 | 573 |
| 5 | 573.1 | 575 |

**Notes:**
1. Bin categories are established for classification of products. Products may not be available in all bin categories.
2. Tolerance for each color bin limit is ± 1.0 nm.

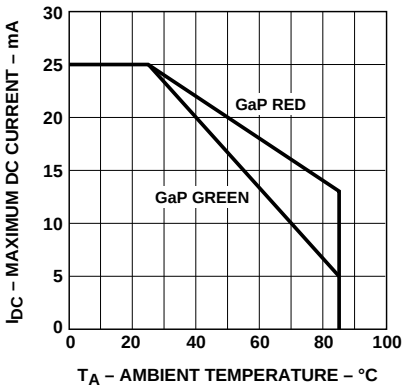



**Figure 1. Maximum allowable average current per dot vs. ambient temperature.**

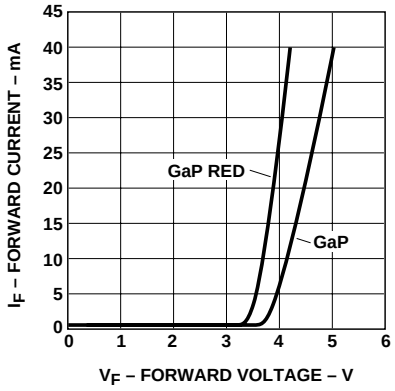



**Figure 2. Forward current vs. forward voltage.**

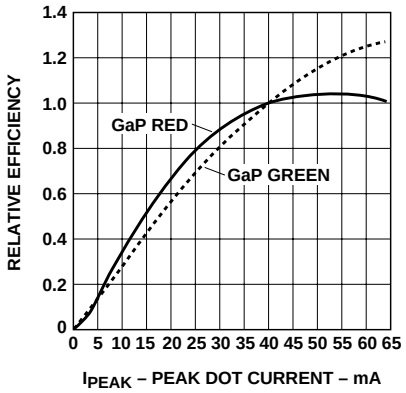



**Figure 3. Relative efficiency (luminous intensity per dot) vs. peak current per dot.**

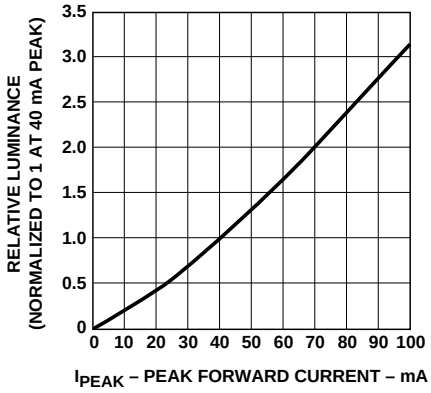



**Figure 4. Relative luminance vs. peak forward current.**

### 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.

### Device Reliability

For reliability information, please see the reliability data sheet *91.44 mm General Purpose 5 x 7 Dot Matrix Alphanumeric Displays*.

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

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