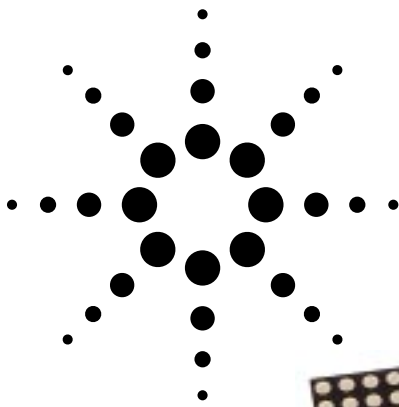


# Agilent HDSP-S51E Series

## 27.4 mm (1.08 inch) General Purpose

### 5 x 7 Dot Matrix Alphanumeric Displays

#### Data Sheet



#### Description

These displays have a 27.4 mm (1.08 inch) character height and use industry standard size and pin-out. 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 (HER) or GaP

Green colors. The Bi-color display consists of GaP Red and Green colors.

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

#### Features

- **5 x 7 Dot matrix font**
- **Stackable horizontally**
- **Industry standard pin-out**
  - 22.86 mm (0.9 in.) Dual-In-Line (DIP) leads on 2.54 mm (0.1 in.) centers
- **Choice of colors**
  - Single color: GaP Red or GaP Green
  - Bi-color: GaP Red and GaP Green
- **Face paint color: black**
- **Design flexibility**
  - Common row anode or common row cathode
- **Categorized for luminous intensity or luminance**
- **Green categorized for color**

#### Devices

GaP Red HDSP-	Green HDSP-	Description
S51E	S51G	27.4 mm Black Surface Common Row Anode
S56E	S56G	27.4 mm Black Surface Common Row Cathode
	B51Z	27.4 mm Black Surface Bi-Color Common Row Anode
	B56Z	27.4 mm Black Surface Bi-Color Common Row Cathode

#### Note:

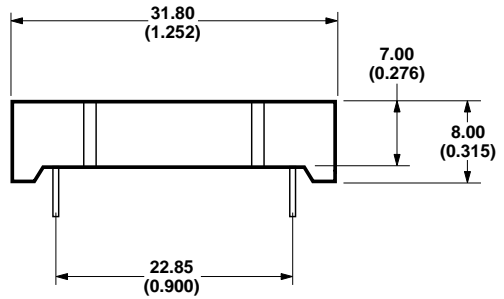
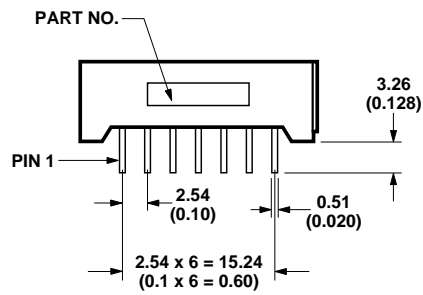
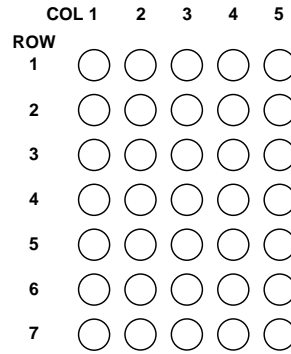
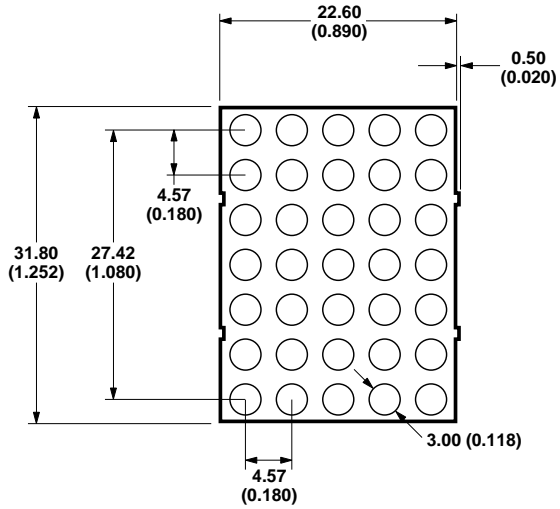
1. For details, please contact your local Agilent components sales office or an authorized distributor.

#### 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<sup>[1]</sup>**

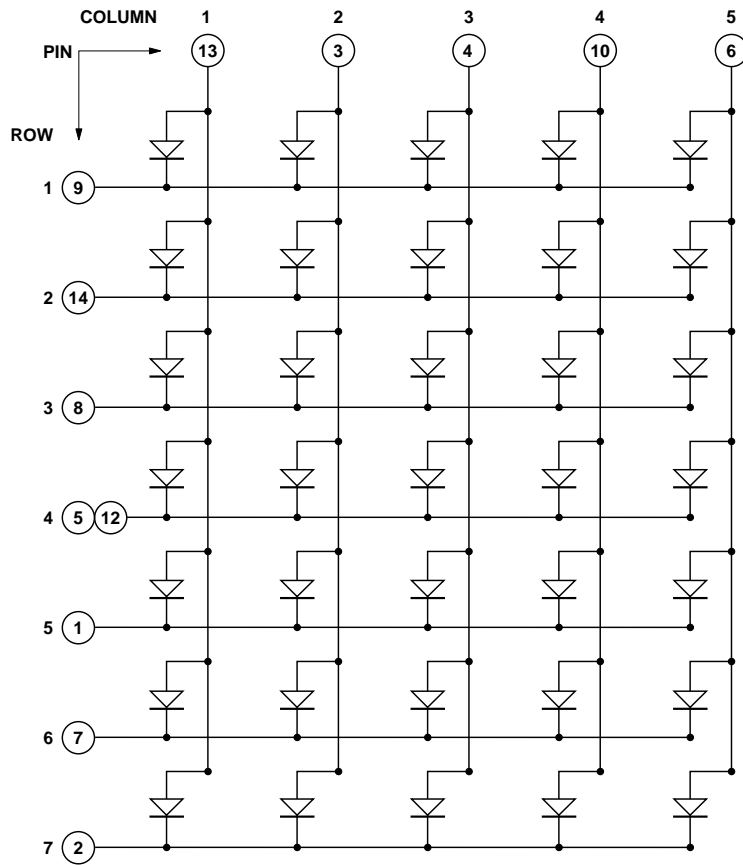
# Package Dimensions

Single Color



## Internal Circuit Diagram

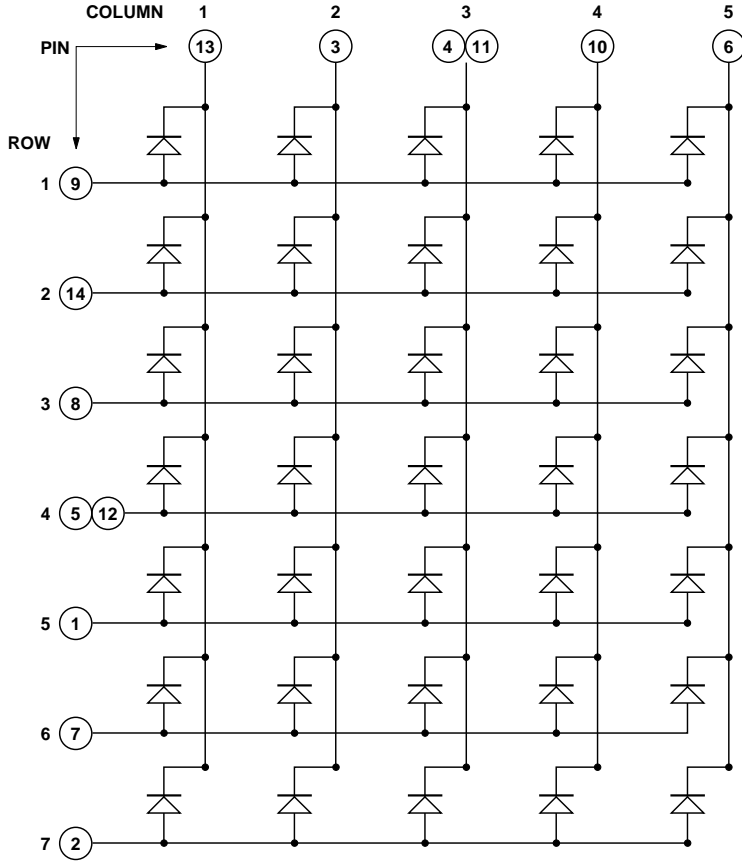
Common Row Cathode (Single Color)



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

# Internal Circuit Diagram

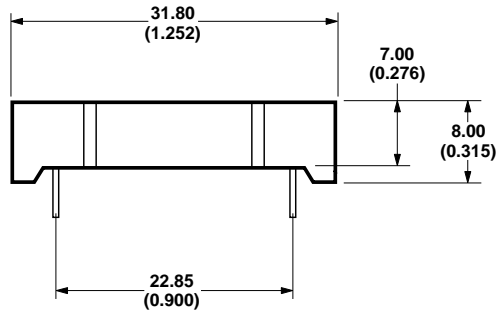
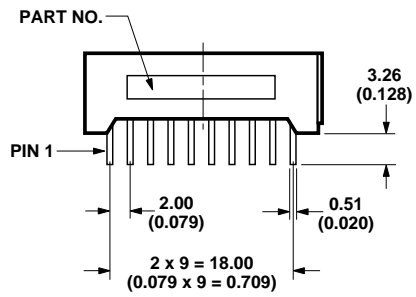
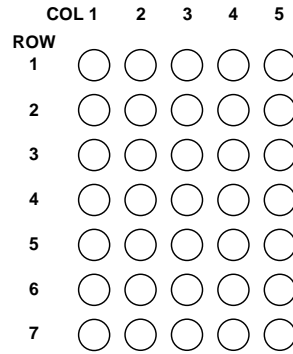
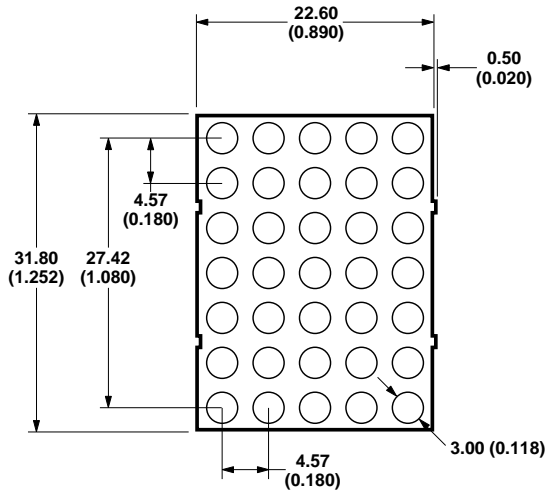
Common Row Anode (Single Color)



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

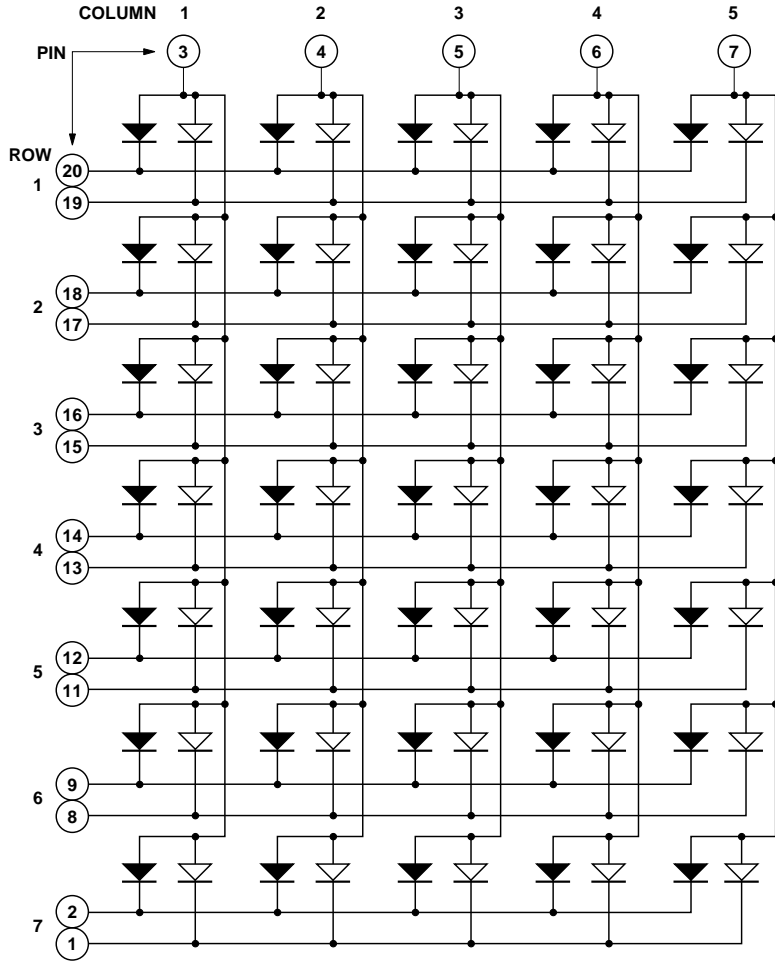
# Package Dimensions

Bi-Color



# Internal Circuit Diagram

Common Row Cathode (Bi-Color)



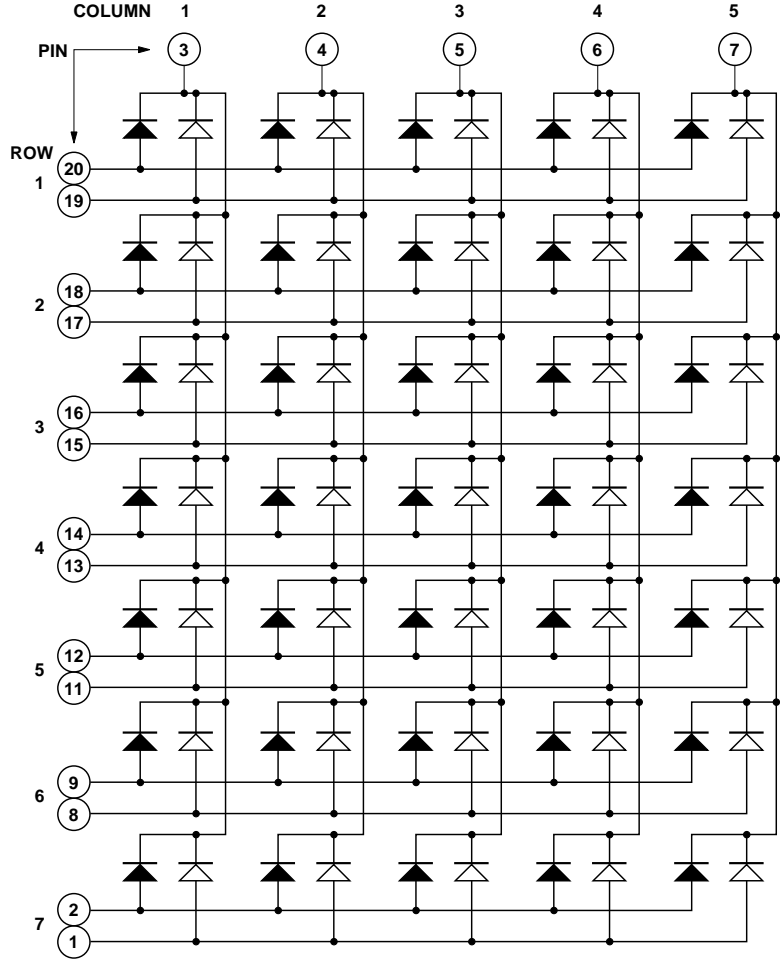
THE SIGN  STANDS FOR HER COLOR DICE



THE SIGN  STANDS FOR GREEN COLOR DICE

PIN NO.	CONNECTION
1	ROW 7 (GREEN)
2	ROW 7 (HER)
3	COLUMN 1
4	COLUMN 2
5	COLUMN 3
6	COLUMN 4
7	COLUMN 5
8	ROW 6 (GREEN)
9	ROW 6 (HER)
10	NC
11	ROW 5 (GREEN)
12	ROW 5 (HER)
13	ROW 4 (GREEN)
14	ROW 4 (HER)
15	ROW 3 (GREEN)
16	ROW 3 (HER)
17	ROW 2 (GREEN)
18	ROW 2 (HER)
19	ROW 1 (GREEN)
20	ROW 1 (HER)

# Internal Circuit Diagram

Common Row Anode (Bi-Color)



THE SIGN  STANDS FOR HER COLOR DICE  
 THE SIGN  STANDS FOR GREEN COLOR DICE

PIN NO.	CONNECTION
1	ROW 7 (GREEN)
2	ROW 7 (HER)
3	COLUMN 1
4	COLUMN 2
5	COLUMN 3
6	COLUMN 4
7	COLUMN 5
8	ROW 6 (GREEN)
9	ROW 6 (HER)
10	NC
11	ROW 5 (GREEN)
12	ROW 5 (HER)
13	ROW 4 (GREEN)
14	ROW 4 (HER)
15	ROW 3 (GREEN)
16	ROW 3 (HER)
17	ROW 2 (GREEN)
18	ROW 2 (HER)
19	ROW 1 (GREEN)
20	ROW 1 (HER)

**Absolute Maximum Ratings at T<sub>A</sub> = 25°C**

<b>Parameter</b>	<b>GaP Red HDSP-S51E/S56E/B51Z/B56Z</b>	<b>GaP Green HDSP-S51G/S56G/B51Z/B56Z</b>	<b>Units</b>
Average Power per Dot <sup>[1]</sup>	65	65	mW
Peak Forward Current per Dot <sup>[1]</sup> (1/8 Duty Cycle at 10 KHz)	80	100	mA
Average Forward Current per Dot	25 <sup>[1,2]</sup>	25 <sup>[1,3]</sup>	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
Lead Solder Temperature for 3 seconds <sup>[4]</sup> (2 mm [0.078 in.] below seating plane)	260	260	°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<sub>A</sub> = 25°C

### GaP Red

Devices							
HDSP-	Parameter	Symbol	Min.	Typ.	Max.	Units	Test Conditions
S51E	Luminous Intensity/Unit (Digit Average) <sup>[1]</sup>	I <sub>v</sub>	0.97	1.5	3.3	mcd	I <sub>FP</sub> = 40 mA, 1/8 Duty Factor
	Peak Wavelength	λ <sub>peak</sub>		632		nm	I <sub>F</sub> = 20 mA
S56E	Dominant Wavelength <sup>[2]</sup>	λ <sub>d</sub>		622		nm	I <sub>F</sub> = 20 mA
B51Z	Forward Voltage	V <sub>F</sub>		2.1	2.6	V	I <sub>F</sub> = 20 mA
B56Z	Reverse Voltage <sup>[3]</sup>	V <sub>R</sub>	3.0			V	I <sub>R</sub> = 100 μA
	Luminous Intensity Matching Ratio	I <sub>v-m</sub>			2:1		I <sub>FP</sub> = 40 mA, 1/8 Duty Factor

### GaP Green

Devices							
HDSP-	Parameter	Symbol	Min.	Typ.	Max.	Units	Test Conditions
S51G	Luminous Intensity/Unit (Digit Average) <sup>[1]</sup>	I <sub>v</sub>	1.46	3.0	4.97	mcd	I <sub>FP</sub> = 40 mA, 1/8 Duty Factor
	Peak Wavelength	λ <sub>peak</sub>		568		nm	I <sub>F</sub> = 20 mA
S56G	Dominant Wavelength <sup>[2]</sup>	λ <sub>d</sub>		573		nm	I <sub>F</sub> = 20 mA
B51Z	Forward Voltage	V <sub>F</sub>		2.3	2.6	V	I <sub>F</sub> = 20 mA
B56Z	Reverse Voltage <sup>[3]</sup>	V <sub>R</sub>	3.0			V	I <sub>R</sub> = 100 μA
	Luminous Intensity Matching Ratio	I <sub>v-m</sub>			2:1		I <sub>FP</sub> = 40 mA, 1/8 Duty Factor

### Bi-Color

Devices							
HDSP-	Parameter	Symbol	Min.	Typ.	Max.	Units	Test Conditions
B51Z	Luminance/Unit (Digit Average) <sup>[1]</sup>	I <sub>v</sub>	86.0	180.0	310.0	Cd/m <sup>2</sup>	I <sub>FP</sub> = 40 mA, 1/8 Duty Factor
B56Z							

#### Notes:

1. The digits are categorized for luminance. The luminance category is designated by a letter on the side of the package.
2. The dominant wavelength, λ<sub>d</sub>, 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<sup>[1]</sup> (mcd at I<sub>FP</sub> = 40 mA, 1/8 Duty Factor)****GaP Red**

Bin Name	Min. <sup>[2]</sup>	Max. <sup>[2]</sup>
E	0.97	1.45
F	1.46	2.19
G	2.2	3.3

**GaP Green**

Bin Name	Min. <sup>[2]</sup>	Max. <sup>[2]</sup>
F	1.46	2.19
G	2.20	3.30
H	3.31	4.97

**Bi-Color (Cd/m<sup>2</sup> at I<sub>FP</sub> = 40 mA, 1/8 Duty Factor)**

Bin Name	Min. <sup>[2]</sup>	Max. <sup>[2]</sup>
F	86	104
G	104.1	124
H	124.1	149
I	149.1	179
J	179.1	215
K	215.1	258
L	258.1	310

**Hue Grade**

Coordinate	Bin						
	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:**

- Hue categories are established for classification of products. Products may not be available in all bin categories.
- Tolerance for each intensity bin limit is  $\pm 10\%$ .

**Color Bin Limits (nm)<sup>[1]</sup>****Green**

Bin Name	Min. <sup>[2]</sup>	Max. <sup>[2]</sup>
3	569.1	571
4	571.1	573
5	573.1	575

**Notes:**

- Bin categories are established for classification of products. Products may not be available in all bin categories.
- Tolerance for each color bin limit is  $\pm 1.0$  nm.

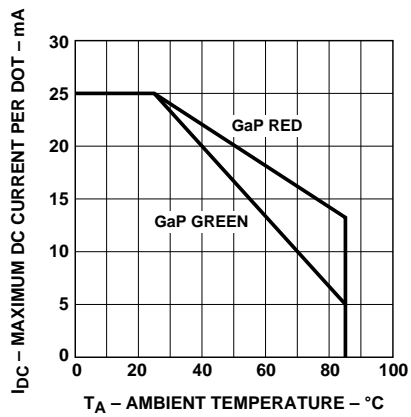


Figure 1. Maximum allowable average current per dot vs. ambient temperature.

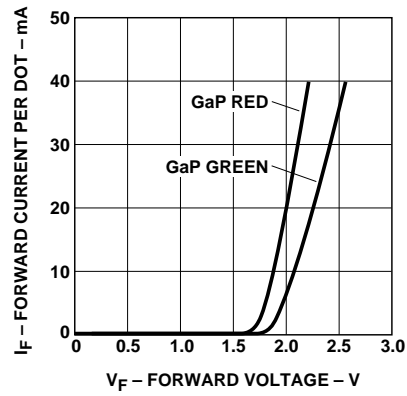


Figure 2. Forward current vs. forward voltage.

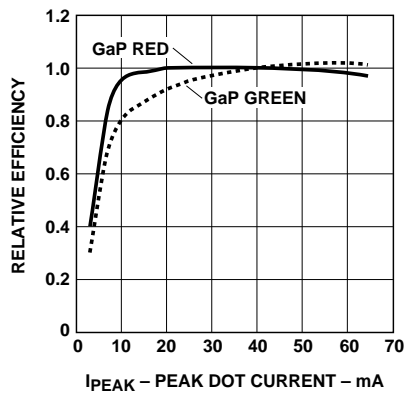


Figure 3. Relative efficiency (luminous intensity per dot) vs. peak current per dot.

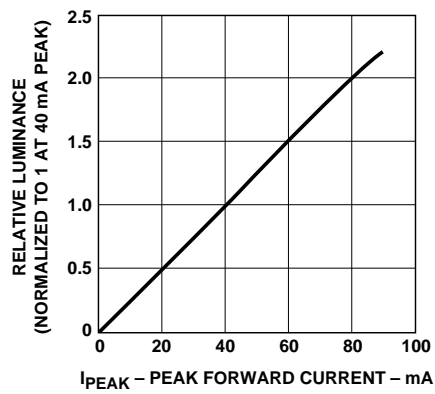


Figure 4. Relative luminance vs. peak forward current.

**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 *27.4 mm General Purpose 5 x 7 Dot Matrix Alphanumeric Displays*.

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

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

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