SMD Ultraviolet Emitter on MCPCB Hex Star (SB1)

High UV power density in easy to use format

Offering high radiant output from a compact package, the RayVio SMD on metal core printed circuit board (MCPCB) Star enables high radiation density applications. Spectral output peak wavelengths are 285nm and 310nm typical which enable powerful and compact applications in disinfection and skin treatment.

Features and Benefits

- UV power output up to 10mW enables higher output, more compact applications
- 285nm typical spectrum with proven germicidal efficacy and 310nm for skin treatment
- Industry standard surface mount device (SMD) package to lower integration costs
- Small, bolt-down package with metal core enables simple assembly and high thermal conductivity

Applications

- Water disinfection
- Surface disinfection
- Air disinfection
- Food and pharmaceutical processing
- UV curing of inks, adhesives and coatings
- Horticulture lighting
- Skin treatment
Table of Contents

Product Nomenclature .................................................................................................................................................. 3

Product Performance and Characterization Guide ...................................................................................................... 4
  Typical Optical Characteristics .................................................................................................................................. 4
  Typical Electrical Characteristics ............................................................................................................................. 4

Absolute Maximum Ratings ........................................................................................................................................... 5

Typical Characteristic Curves ....................................................................................................................................... 6

Typical Characteristic Curves (continued) ..................................................................................................................... 7

Mechanical Dimensions .................................................................................................................................................. 8

Product Binning and Labeling ..................................................................................................................................... 9
  Purpose of Product Binning ....................................................................................................................................... 9
  Product Bin Label Structure ...................................................................................................................................... 9

Power Output, Peak Wavelength and Forward Voltage Bins ........................................................................................ 9

Packing Information ....................................................................................................................................................... 11

Product Labeling ............................................................................................................................................................ 11

Cautions on Use ............................................................................................................................................................... 12
  Eye and Skin Safety Guidelines ................................................................................................................................ 12
  Thermal Management ................................................................................................................................--------------- 12
  Static Electricity .......................................................................................................................................................... 12

Revision History .............................................................................................................................................................. 13

About Rayvio ..................................................................................................................................................................... 13
Product Nomenclature

Preliminary part numbers listed below with part descriptions are used to identify part configuration (subject to change)

For SMD part emitter mounted on MCPCB Star:

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Part Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>RV-285-SMDSB1-00</td>
<td>285nm nominal wavelength, up to 10mW power output</td>
</tr>
<tr>
<td>RV-310-SMDSB1-00</td>
<td>310nm nominal wavelength, up to 10mW power output</td>
</tr>
</tbody>
</table>

Other wavelengths are available upon request.

Environmental Compliance

RayVio is committed to providing environmentally friendly products to the healthcare and hygiene management marketplace. RayVio is compliant to the European Union directives on the restriction of hazardous substances in electronic equipment, namely the RoHS directive. RayVio products do not contain the restricted materials: lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls (PBB) or polybrominated diphenyl ethers (PBDE).
Product Performance and Characterization Guide

Typical Optical Characteristics

Table 1. Performance Characteristics at T_j= 25°C

<table>
<thead>
<tr>
<th>Typical Wavelength (nm)</th>
<th>Part Number</th>
<th>Radiant Output @ 100mA, 25°C</th>
<th>Spectral Width (nm) (FWHM)</th>
<th>Viewing Angle (deg. HM)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Minimum (mW)</td>
<td>Typical (mW)</td>
<td>Maximum (mW)</td>
</tr>
<tr>
<td>285</td>
<td>RV-285-SMDSB1-00</td>
<td>4</td>
<td>8</td>
<td>10</td>
</tr>
<tr>
<td>310</td>
<td>RV-310-SMDSB1-00</td>
<td>4</td>
<td>8</td>
<td>10</td>
</tr>
</tbody>
</table>

Table 2. Performance Characteristics at T_j= 25°C

<table>
<thead>
<tr>
<th>Typical Wavelength (nm)</th>
<th>Part Number</th>
<th>Emission Peak Wavelength</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Minimum (nm)</td>
</tr>
<tr>
<td>285</td>
<td>RV-285-SMDSB1-00</td>
<td>280</td>
</tr>
<tr>
<td>310</td>
<td>RV-310-SMDSB1-00</td>
<td>305</td>
</tr>
</tbody>
</table>

Notes for Tables 1 and 2:

1 Production parts are tested at nominal current of 100mA, 25°C.

Typical Electrical Characteristics

Electrical Characteristics of UV device

Solder Pad Temperature = 25°C, Test Current = 100mA

Table 3.

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Forward Voltage V_f</th>
<th>Typical Thermal Resistance Junction to Solder Pad (°C/W)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Minimum</td>
<td>Typical</td>
</tr>
<tr>
<td>RV-285-SMDSB1-00</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>RV-310-SMDSB1-00</td>
<td>6</td>
<td>7</td>
</tr>
</tbody>
</table>
Notes for Table 3:

1 Measured between $T_j = 25^\circ C$ and $T_j = 60^\circ C$.

**Absolute Maximum Ratings**

Table 4.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Maximum Performance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power Dissipation</td>
<td>1.0W</td>
</tr>
<tr>
<td>Forward Current</td>
<td>100mA</td>
</tr>
<tr>
<td>Reverse Voltage(^1)</td>
<td>tbd</td>
</tr>
<tr>
<td>Junction Temperature, $T_j$</td>
<td>60°C</td>
</tr>
<tr>
<td>Storage Temperature</td>
<td>-30, 100°C</td>
</tr>
<tr>
<td>ESD Sensitivity</td>
<td>tbd</td>
</tr>
</tbody>
</table>

Note:

\(^1\) products are not designed for reverse bias operation
Typical Characteristic Curves

**Spectrum**

- Relative Power vs. Wavelength [nm]
  - Wavelength range: 250 to 330 nm
  - Relative Power scale: 0% to 100%

**Radiant Power vs. Drive Current**

- Relative Radiant Flux vs. Drive Current [mA]
  - Drive Current range: 0 to 100 mA

**Angular Emission Intensity Distribution**

- Relative Power vs. Angular Emission
  - Angular Emission Range: -90° to 90°
  - Relative Power Scale: 0% to 100%

**Forward Current vs. Voltage**

- Current vs. Voltage [V]
  - Voltage range: 0 to 9 V
  - Current range: 0 to 100 mA
Typical Characteristic Curves (continued)

Radiant Power vs. Temperature

Peak Wavelength vs. Temperature

Voltage vs. Temperature

Peak Wavelength vs Drive Current
Mechanical Dimensions

1. All dimensions in millimeters
2. Scale: none
3. Undefined tolerance: X.XX = ±0.1

Material Information:
1. Package body: Ceramic
2. Lens: Fused silica
3. MCPCB

PCB thickness: 0.7mm

Assembly Information:
1. Part is designed for bolt down attach
2. Screw size: 440 or M3
3. Use thermal grease at interface for maximum heat conductivity and performance
Product Binning and Labeling

Purpose of Product Binning
In the manufacturing process, the products described here are produced in a distribution around the typical performance values listed. RayVio sorts and labels products into bins according to output power, peak wavelength and forward voltage.

Product Bin Label Structure
All emitters packaged together are sorted to the same bin. The bin code label is a 9 digit code printed on the label. Combinations of various bins may be used to optimize the consistency of the application.

The bin code labels follow the alphanumeric code structure below.

PxxLxxVxx

Pxx = power output bin
Lxx = wavelength bin
Vxx = Vf bin

Power Output, Peak Wavelength and Forward Voltage Bins
Tables 5, 6 and 7 list the standard functional bins for RayVio emitters (tested and binned at 100mA, 25°C). Although several bins are outlined, product availability in a particular bin varies by production run and by product performance. Not all bins are necessarily available.

Table 5. Power Output Bins

<table>
<thead>
<tr>
<th>Bin Code</th>
<th>Minimum Power Output (mW)</th>
<th>Maximum Power Output (mW)</th>
</tr>
</thead>
<tbody>
<tr>
<td>P02</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>P03</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>P04</td>
<td>6</td>
<td>8</td>
</tr>
<tr>
<td>P05</td>
<td>8</td>
<td>10</td>
</tr>
</tbody>
</table>

Table 6. Peak Wavelength Bins

<table>
<thead>
<tr>
<th>Bin Code</th>
<th>Minimum Peak Wavelength (nm)</th>
<th>Maximum Peak Wavelength (nm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>L07</td>
<td>280</td>
<td>285</td>
</tr>
<tr>
<td>L08</td>
<td>285</td>
<td>290</td>
</tr>
<tr>
<td>L12</td>
<td>305</td>
<td>310</td>
</tr>
<tr>
<td>L13</td>
<td>310</td>
<td>315</td>
</tr>
</tbody>
</table>
Table 7. Forward Voltage Bins

<table>
<thead>
<tr>
<th>Bin Code</th>
<th>Minimum Forward Voltage (V)</th>
<th>Maximum Forward Voltage (V)</th>
</tr>
</thead>
<tbody>
<tr>
<td>V11</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>V12</td>
<td>7</td>
<td>8</td>
</tr>
<tr>
<td>V13</td>
<td>8</td>
<td>9</td>
</tr>
<tr>
<td>V14</td>
<td>9</td>
<td>10</td>
</tr>
</tbody>
</table>
Packing Information

Hex star components are packaged in plastic carrying trays. Detailed specifications tbd.

Product Labeling

Label A

Specifying Part Number, Quantity and Lot Number

Example

[Destination field]
P/N: RV-285-SMDSB1-00
Package Type: tbd
Lot #: ZY51_151117
Qty:10 Date: mm/dd/yyyy
Cautions on Use

Eye and Skin Safety Guidelines
Do not directly look at the light when the LEDs are on. Proceed with caution to avoid the risk of damage to the eyes when examining the LEDs with optical instruments. Protect your eyes and skin when operating. Equipment should be designed to completely screen or filter UV radiation.

The attached label should be used on products and systems that use UV LEDs.

Thermal Management
The thermal design of the system must be considered, particularly at the beginning of the system design process. In order to maximize performance it is necessary to reduce heat in the system by optimizing thermal conductivity of circuit boards and housings and also by minimizing density of the LED array and other components.

Static Electricity
Wristbands and anti-electrostatic gloves are strongly recommended and all devices, equipment and machinery must be properly grounded when handling the LEDs, which are sensitive to static electricity. Precautions should be taken against surge voltage to the equipment that mounts the LEDs. Unusual characteristics such as significant increase of current leakage, decrease of turn-on voltage, or non-operation at a low current can occur when the LED is damaged.
Revision History

<table>
<thead>
<tr>
<th>Revision</th>
<th>Date</th>
<th>Contents of Revision Change</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rev 1.0</td>
<td>May 5, 2016</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rev 2.0</td>
<td>May 16, 2016</td>
<td></td>
<td></td>
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</tbody>
</table>

About Rayvio

RayVio Corp. is an advanced health and hygiene company that delivers clean water and environments. RayVio helps protect billions from germs and creates new markets and revenue streams by enabling a new class of products. Its powerful and efficient UV LED technology can be integrated into a variety of applications, powering versatile on-demand solutions that give consumers control over health without chemicals or costly consumables. To learn more, please visit [www.rayvio.com](http://www.rayvio.com).