Ultrabright 0603 SMD LED

DESCRIPTION
The new 0603 LED series have been designed in the smallest SMD package. This innovative 0603 LED technology opens the way to
- smaller products of higher performance
- more design in flexibility
- enhanced applications

The 0603 LED is an obvious solution for small-scale, high power products that are expected to work reliability in an arduous environment.

The reflector inside this package is filled with a mixture of epoxy and yellow converter.

This yellow converter converts the blue emission partially to yellow, which mixes the remaining blue to give white.

PRODUCT GROUP AND PACKAGE DATA
- Product group: LED
- Package: SMD 0603
- Product series: standard
- Angle of half intensity: ± 80°

FEATURES
- High efficient InGaN technology
- Smallest SMD package 0603 with exceptional brightness 1.6 mm x 0.8 mm x 0.6 mm (L x W x H)
- High reliability lead frame based
- Temperature range -40 °C to +100 °C
- Chromaticity coordinate categorized according to CIE1931 per packing unit
- Typical color temperature 5500 K
- EIA and ICE standard package
- Compatible to IR reflow soldering
- Available in 8 mm tape reel
- Preconditioning according to JEDEC® level 2
- ESD-withstand voltage: up to 1 kV according to JESD22-A114-B
- AEC-Q101 qualified
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

APPLICATIONS
- Automotive: backlighting in dashboards, switches, and keypads
- Telecommunication: indicator and backlighting in telephone and fax
- Backlighting for audio, and video equipment
- Backlighting in office equipment
- Indoor and outdoor message boards
- Flat backlight for LCDs, switches, and symbols

PARTS TABLE

<table>
<thead>
<tr>
<th>PART</th>
<th>COLOR</th>
<th>LUMINOUS INTENSITY (mcd)</th>
<th>at I(F) (mA)</th>
<th>COORDINATE (x, y)</th>
<th>at I(F) (mA)</th>
<th>FORWARD VOLTAGE (V)</th>
<th>at I(F) (mA)</th>
<th>TECHNOLOGY</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>MIN.</td>
<td>TYP.</td>
<td>MAX.</td>
<td>MIN.</td>
<td>TYP.</td>
<td>MAX.</td>
<td></td>
</tr>
<tr>
<td>VLMW11R2S2-5K8L-08</td>
<td>White</td>
<td>140</td>
<td>280</td>
<td>10</td>
<td>0.33, 0.33</td>
<td>10</td>
<td>2.9, 4.0</td>
<td>20 InGaN / yellow converter</td>
</tr>
<tr>
<td>VLMW11R2S1-6K-08</td>
<td>White</td>
<td>140</td>
<td>224</td>
<td>10</td>
<td>0.32, 0.305</td>
<td>10</td>
<td>2.9, 4.0</td>
<td>20 InGaN / yellow converter</td>
</tr>
</tbody>
</table>

ABSOLUTE MAXIMUM RATINGS (T_amb = 25 °C, unless otherwise specified)

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>TEST CONDITION</th>
<th>SYMBOL</th>
<th>VALUE</th>
<th>UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reverse voltage (1)</td>
<td>I_R max. = 10 μA</td>
<td>V_R</td>
<td>5</td>
<td>V</td>
</tr>
<tr>
<td>DC forward current</td>
<td>T_amb ≤ 60 °C</td>
<td>I_F</td>
<td>20</td>
<td>mA</td>
</tr>
<tr>
<td>Surge forward current</td>
<td>t_F ≤ 10 μs</td>
<td>I_FSM</td>
<td>0.1</td>
<td>A</td>
</tr>
<tr>
<td>Power dissipation</td>
<td></td>
<td>P_V</td>
<td>80</td>
<td>mW</td>
</tr>
<tr>
<td>Junction temperature</td>
<td></td>
<td>T_J</td>
<td>110</td>
<td>°C</td>
</tr>
<tr>
<td>Storage temperature range</td>
<td></td>
<td>T_stg</td>
<td>-40 to +100</td>
<td>°C</td>
</tr>
<tr>
<td>Operating temperature range</td>
<td></td>
<td>T_amb</td>
<td>-40 to +100</td>
<td>°C</td>
</tr>
<tr>
<td>Thermal resistance junction-ambient</td>
<td>Mounted on PC board (pad size &gt; 16 mm²)</td>
<td>R_enJA</td>
<td>480</td>
<td>K/W</td>
</tr>
</tbody>
</table>

Note
(1) Driving the LED in reverse direction is suitable for short term application

Rev. 1.7, 18-Aug-2020

For technical questions, contact: LED@vishay.com

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OPTICAL AND ELECTRICAL CHARACTERISTICS (\(T_{\text{amb}} = 25 \, ^\circ\text{C}\), unless otherwise specified)

VLMW11.., WHITE

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>TEST CONDITION</th>
<th>PART</th>
<th>SYMBOL</th>
<th>MIN.</th>
<th>TYP.</th>
<th>MAX.</th>
<th>UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Luminous intensity</td>
<td>(I_F = 10 , \text{mA}) VLMW11R2S2-5K8L</td>
<td>(I_V)</td>
<td>140</td>
<td>-</td>
<td>280</td>
<td>-</td>
<td>mcd</td>
</tr>
<tr>
<td></td>
<td>VLMW11R2S1-6K</td>
<td></td>
<td>140</td>
<td>-</td>
<td>224</td>
<td>-</td>
<td>mcd</td>
</tr>
<tr>
<td>Chromaticity coordinate x acc. to CIE 1931</td>
<td>(I_F = 10 , \text{mA}) VLMW11R2S2-5K8L</td>
<td>(x)</td>
<td>-</td>
<td>0.33</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td></td>
<td>VLMW11R2S1-6K</td>
<td></td>
<td>-</td>
<td>0.32</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Chromaticity coordinate y acc. to CIE 1931</td>
<td>(I_F = 10 , \text{mA}) VLMW11R2S2-5K8L</td>
<td>(y)</td>
<td>-</td>
<td>0.33</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td></td>
<td>VLMW11R2S1-6K</td>
<td></td>
<td>-</td>
<td>0.305</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Angle of half intensity</td>
<td>(I_F = 10 , \text{mA})</td>
<td>(\phi)</td>
<td>-</td>
<td>± 80</td>
<td>-</td>
<td>-</td>
<td>°</td>
</tr>
<tr>
<td>Forward voltage</td>
<td>(I_F = 20 , \text{mA})</td>
<td>(V_F)</td>
<td>2.9</td>
<td>-</td>
<td>4.0</td>
<td>-</td>
<td>V</td>
</tr>
<tr>
<td>Temperature coefficient of (V_F)</td>
<td>(I_F = 10 , \text{mA})</td>
<td>(TC_{V_F})</td>
<td>-</td>
<td>-3</td>
<td>-</td>
<td>-</td>
<td>mV/K</td>
</tr>
<tr>
<td>Temperature coefficient of (I_V)</td>
<td>(I_F = 10 , \text{mA})</td>
<td>(TC_{I_V})</td>
<td>-</td>
<td>-0.4</td>
<td>-</td>
<td>-</td>
<td>%/K</td>
</tr>
</tbody>
</table>

LUMINOUS INTENSITY CLASSIFICATION

<table>
<thead>
<tr>
<th>GROUP</th>
<th>STANDARD</th>
<th>LIGHT INTENSITY (mcd)</th>
<th>OPTIONAL</th>
<th>MIN.</th>
<th>MAX.</th>
</tr>
</thead>
<tbody>
<tr>
<td>R</td>
<td>2</td>
<td>140</td>
<td>180</td>
<td></td>
<td></td>
</tr>
<tr>
<td>S</td>
<td>1</td>
<td>180</td>
<td>224</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>224</td>
<td>280</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note
- Luminous intensity is tested at a current pulse duration of 25 ms and an accuracy of ± 11 %.
- The above type numbers represent the order groups which include only a few brightness groups. Only one group will be shipped on each reel (there will be no mixing of two groups on each reel). In order to ensure availability, single brightness groups are not be orderable.
- In a similar manner for colors where wavelength groups are measured and binned, single wavelength groups will be shipped on any one reel.
- In order to ensure availability, single wavelength groups are not be orderable.

CROSSING TABLE

<table>
<thead>
<tr>
<th>VISHAY</th>
<th>OSRAM</th>
</tr>
</thead>
<tbody>
<tr>
<td>VLMW11R2S2</td>
<td>LWL28G-R2S2</td>
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</tbody>
</table>

CHROMATICITY COORDINATED GROUPS FOR WHITE SMD LED

<table>
<thead>
<tr>
<th>5L</th>
<th>X</th>
<th>Y</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.291</td>
<td>0.268</td>
<td></td>
</tr>
<tr>
<td>0.285</td>
<td>0.279</td>
<td></td>
</tr>
<tr>
<td>0.307</td>
<td>0.312</td>
<td></td>
</tr>
<tr>
<td>0.310</td>
<td>0.297</td>
<td></td>
</tr>
<tr>
<td>0.296</td>
<td>0.259</td>
<td></td>
</tr>
<tr>
<td>0.291</td>
<td>0.268</td>
<td></td>
</tr>
<tr>
<td>0.310</td>
<td>0.297</td>
<td></td>
</tr>
<tr>
<td>0.313</td>
<td>0.284</td>
<td></td>
</tr>
<tr>
<td>0.310</td>
<td>0.297</td>
<td></td>
</tr>
<tr>
<td>0.307</td>
<td>0.312</td>
<td></td>
</tr>
<tr>
<td>0.330</td>
<td>0.347</td>
<td></td>
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<tr>
<td>0.330</td>
<td>0.330</td>
<td></td>
</tr>
<tr>
<td>0.313</td>
<td>0.284</td>
<td></td>
</tr>
<tr>
<td>0.310</td>
<td>0.297</td>
<td></td>
</tr>
<tr>
<td>0.330</td>
<td>0.330</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>5K</th>
<th>X</th>
<th>Y</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.330</td>
<td>0.330</td>
<td></td>
</tr>
<tr>
<td>0.330</td>
<td>0.347</td>
<td></td>
</tr>
<tr>
<td>0.347</td>
<td>0.371</td>
<td></td>
</tr>
<tr>
<td>0.345</td>
<td>0.352</td>
<td></td>
</tr>
<tr>
<td>0.330</td>
<td>0.310</td>
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<tr>
<td>0.330</td>
<td>0.330</td>
<td></td>
</tr>
<tr>
<td>0.338</td>
<td>0.342</td>
<td></td>
</tr>
<tr>
<td>0.352</td>
<td>0.344</td>
<td></td>
</tr>
<tr>
<td>0.345</td>
<td>0.352</td>
<td></td>
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<tr>
<td>0.347</td>
<td>0.371</td>
<td></td>
</tr>
<tr>
<td>0.367</td>
<td>0.401</td>
<td></td>
</tr>
<tr>
<td>0.364</td>
<td>0.380</td>
<td></td>
</tr>
<tr>
<td>0.352</td>
<td>0.344</td>
<td></td>
</tr>
<tr>
<td>0.338</td>
<td>0.342</td>
<td></td>
</tr>
<tr>
<td>0.364</td>
<td>0.380</td>
<td></td>
</tr>
<tr>
<td>0.360</td>
<td>0.357</td>
<td></td>
</tr>
</tbody>
</table>

Note
- Chromaticity coordinate groups are tested at a current pulse duration of 25 ms and a tolerance of ± 0.01
**TYPICAL CHARACTERISTICS** (Tamb = 25 °C, unless otherwise specified)

---

**Fig. 1 - Forward Current vs. Ambient Temperature**

**Fig. 2 - Relative Intensity vs. Wavelength**

**Fig. 3 - Forward Current vs. Forward Voltage**

**Fig. 4 - Relative Luminous Intensity vs. Forward Current**

**Fig. 5 - Relative Luminous Intensity vs. Ambient Temperature**

**Fig. 6 - Forward Voltage vs. Ambient Temperature**
REEL DIMENSIONS in millimeters

- **x-Coordinates:**
  - 0.20
  - 0.25
  - 0.30
  - 0.35
  - 0.40

- **y-Coordinates:**
  - 0.20
  - 0.25
  - 0.30
  - 0.35

**Fig. 7 - Coordinates of Colorgroups**

- **x-Coordinates:**
  - 0.25
  - 0.27
  - 0.29
  - 0.31
  - 0.33
  - 0.35
  - 0.37

- **y-Coordinates:**
  - 0.20
  - 0.25
  - 0.30
  - 0.35
  - 0.40

- **19774.3**

- **5L**
  - 6L
  - 7L
  - 8L

- **5K**
  - 6K
  - 7K
  - 8K

Drawing-No: 9.800-5086.01-4
Issue: 1; 29.04.04

Critical dimension for IQA.

Technical drawings according to DIN specifications

Label area with 111x57 depression 0.25

Critical dimension for IQA.

* **ϕ20.5±0.3** (A2)
* **ϕ62.5±0.25** (A5)
* **ϕ180** (A1)
* **ϕ13±0.2** (A4)
* **8.4±0.15** (A6)
* **14.4** (A2)

* Not indicated tolerances ±0.05
* Material: black static dissipative

7.9 (min.)
10.9 (max.)

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TAPE DIMENSIONS in millimeters

Drawing-No.: 9.700-5290.01-4
Issue: 3; 24.09.13

Material: Conductive black PC

Not indicated tolerances ± 0.05
**PACKAGE DIMENSIONS** in millimeters

![Package Diagram]

*Not indicated tolerances ±0.1

Recommended solder pad

**SOLDERING PROFILE**

![Soldering Profile Diagram]

**BAR CODE PRODUCT LABEL** (example)

![Bar Code Diagram]

A. Type of component
B. Manufacturing plant
C. SEL - selection code (bin):
  
  e.g.: R1 = code for luminous intensity group
  5L = code for chrom. coordinate group
D. Date code year / week
E. Day code (e.g. 4: Thursday)
F. Batch no.
G. Total quantity
H. Company code
DRY PACKING
The reel is packed in an anti-humidity bag to protect the devices from absorbing moisture during transportation and storage.

FINAL PACKING
The sealed reel is packed into a cardboard box. A secondary cardboard box is used for shipping purposes.

RECOMMENDED METHOD OF STORAGE
Dry box storage is recommended as soon as the aluminum bag has been opened to prevent moisture absorption. The following conditions should be observed, if dry boxes are not available:

- Storage temperature 10 °C to 30 °C
- Storage humidity ≤ 60 % RH max.

After more than 1 year under these conditions moisture content will be too high for reflow soldering.

In case of moisture absorption, the devices will recover to the former condition by drying under the following condition:

192 h at 40 °C + 5 °C / - 0 °C and < 5 % RH (dry air / nitrogen) or
96 h at 60 °C + 5 °C and < 5 % RH for all device containers or
24 h at 100 °C + 5 °C not suitable for reel or tubes.

An EIA JEDEC standard JESD22-A112 level 2 label is included on all dry bags.

ESD PRECAUTION
Proper storage and handling procedures should be followed to prevent ESD damage to the devices especially when they are removed from the antistatic shielding bag. Electrostatic sensitive devices warning labels are on the packaging.

VISHAY SEMICONDUCTORS STANDARD BAR CODE LABELS
The Vishay Semiconductors standard bar code labels are printed at final packing areas. The labels are on each packing unit and contain Vishay Semiconductors specific data.

Example of JESD22-A112 level 2 label

CAUTION
Level 2

1. Shellfish in sealed bag: 12 months at <40% and <90% relative humidity (RH).
2. After this bag is opened, devices that will be subjected to infrared reflow, vapor-phase reflow, or equivalent processing (pack package body temp 220°C) must be:
   a) Mounted within 1 year at factory conditions of ≤ 50% / 60% RH or
   b) Stored at ≤ 20% RH.
3. Devices require baking, before mounting, if:
   a) Humidity indicator card is >50% when read at 23°C ± 5°C, or
   b) ≥ 60°C ± 5°C / ≤ 5% RH.
4. If baking is required, devices may be baked for:
   a) 192 hours at 40°C + 5°C / 0°C and <5% RH

Example of JESD22-A112 level 2 label
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