Bicolor SMD LED PLCC-3

DESCRIPTION
These devices have been designed to meet the increasing demand for surface mounting technology. The package of the VLMV3100 is the PLCC-3. It consists of a lead frame which is embedded in a white thermoplast. The reflector inside this package is filled up with clear epoxy. This SMD device consists of a red and green chip. So it is possible to choose the color in one device.

PRODUCT GROUP AND PACKAGE DATA
- Product group: LED
- Package: SMD PLCC-3
- Product series: bicolor
- Angle of half intensity: ± 60°

FEATURES
- SMD LED with exceptional brightness
- Multicolored
- Luminous intensity categorized
- Compatible with automatic placement equipment
- EIA and ICE standard package
- Compatible with IR reflow, vapor phase and wave soldering processes according to CECC 00802 and J-STD-020
- Available in 8 mm tape
- Low profile package
- Non-diffused lens: Excellent for coupling to light pipes and backlighting
- Low power consumption
- Luminous intensity ratio in one packaging unit \( \frac{I_{\text{max}}}{I_{\text{min}}} \leq 1.6 \)
- Preconditioning according to JEDEC level 2a
- ESD-withstand voltage: Up to 2 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 and switches
- Telecommunication: Indicator and backlighting in telephone and fax
- Indicator and backlight for audio and video equipment
- Indicator and backlight in office equipment
- Flat backlight for LCDs, switches, and symbols
- General use

PARTS TABLE

<table>
<thead>
<tr>
<th>PART</th>
<th>COLOR</th>
<th>LUMINOUS INTENSITY (mcd)</th>
<th>at ( I_F ) (mA)</th>
<th>WAVELENGTH (nm)</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>MIN.</td>
</tr>
<tr>
<td>VLMV3100-GS08</td>
<td>Red</td>
<td>2.8</td>
<td>10</td>
<td>-</td>
<td>10</td>
<td>612</td>
<td>620</td>
<td>625</td>
</tr>
<tr>
<td>VLMV3100-GS08</td>
<td>Green</td>
<td>2.8</td>
<td>8</td>
<td>-</td>
<td>10</td>
<td>562</td>
<td>571</td>
<td>575</td>
</tr>
<tr>
<td>VLMV3100-GS18</td>
<td>Red</td>
<td>2.8</td>
<td>10</td>
<td>-</td>
<td>10</td>
<td>612</td>
<td>620</td>
<td>625</td>
</tr>
<tr>
<td>VLMV3100-GS18</td>
<td>Green</td>
<td>2.8</td>
<td>8</td>
<td>-</td>
<td>10</td>
<td>562</td>
<td>571</td>
<td>575</td>
</tr>
</tbody>
</table>
**ABSOLUTE MAXIMUM RATINGS** (T_{amb} = 25 \degree C, unless otherwise specified)  
*VLMV3100*

<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 per diode (1)</td>
<td>I_{R} = 10 \mu A</td>
<td>V_{R}</td>
<td>6</td>
<td>V</td>
</tr>
<tr>
<td>DC forward current per diode</td>
<td>T_{amb} \leq 60 \degree C</td>
<td>I_{F}</td>
<td>30</td>
<td>mA</td>
</tr>
<tr>
<td>Surge forward current per diode</td>
<td>t_{p} \leq 10 \mu s</td>
<td>I_{FSM}</td>
<td>0.5</td>
<td>A</td>
</tr>
<tr>
<td>Power dissipation per diode</td>
<td></td>
<td>P_{V}</td>
<td>100</td>
<td>mW</td>
</tr>
<tr>
<td>Junction temperature</td>
<td></td>
<td>T_{J}</td>
<td>100</td>
<td>\degree C</td>
</tr>
<tr>
<td>Operating temperature range</td>
<td>T_{amb}</td>
<td></td>
<td>-40 to +100</td>
<td>\degree C</td>
</tr>
<tr>
<td>Storage temperature range</td>
<td>T_{stg}</td>
<td></td>
<td>-40 to +100</td>
<td>\degree C</td>
</tr>
<tr>
<td>Thermal resistance junction/ambient</td>
<td>Mounted on PC board (pad size &gt; 16 mm^2)</td>
<td>R_{JUA}</td>
<td>400</td>
<td>K/W</td>
</tr>
</tbody>
</table>

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

**OPTICAL AND ELECTRICAL CHARACTERISTICS** (T_{amb} = 25 \degree C, unless otherwise specified)  
*VLMV3100, RED*

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>TEST CONDITION</th>
<th>SYMBOL</th>
<th>MIN.</th>
<th>TYP.</th>
<th>MAX.</th>
<th>UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Luminous intensity (1)</td>
<td>I_{F} = 10 mA</td>
<td>I_{V}</td>
<td>2.8</td>
<td>10</td>
<td>-</td>
<td>mcd</td>
</tr>
<tr>
<td>Dominant wavelength</td>
<td>I_{F} = 10 mA</td>
<td>\lambda_{d}</td>
<td>612</td>
<td>620</td>
<td>625</td>
<td>nm</td>
</tr>
<tr>
<td>Peak wavelength</td>
<td>I_{F} = 10 mA</td>
<td>\lambda_{P}</td>
<td>-</td>
<td>635</td>
<td>-</td>
<td>nm</td>
</tr>
<tr>
<td>Angle of half intensity</td>
<td>I_{F} = 10 mA</td>
<td>\phi</td>
<td>-</td>
<td>\pm 60</td>
<td>-</td>
<td>deg</td>
</tr>
<tr>
<td>Forward voltage per diode</td>
<td>I_{F} = 20 mA</td>
<td>V_{F}</td>
<td>-</td>
<td>2.0</td>
<td>3</td>
<td>V</td>
</tr>
<tr>
<td>Reverse current per diode</td>
<td>V_{R} = 6 V</td>
<td>I_{R}</td>
<td>-</td>
<td>-</td>
<td>10 \alpha A</td>
<td></td>
</tr>
<tr>
<td>Junction capacitance per diode</td>
<td>V_{R} = 0 V, f = 1 MHz</td>
<td>C_{J}</td>
<td>-</td>
<td>15</td>
<td>-</td>
<td>pF</td>
</tr>
</tbody>
</table>

Note  
(1) In one packing unit I_{Vmax}/I_{Vmin} \leq 1.6

**OPTICAL AND ELECTRICAL CHARACTERISTICS** (T_{amb} = 25 \degree C, unless otherwise specified)  
*VLMV3100, GREEN*

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>TEST CONDITION</th>
<th>SYMBOL</th>
<th>MIN.</th>
<th>TYP.</th>
<th>MAX.</th>
<th>UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Luminous intensity (1)</td>
<td>I_{F} = 10 mA</td>
<td>I_{V}</td>
<td>2.8</td>
<td>8</td>
<td>-</td>
<td>mcd</td>
</tr>
<tr>
<td>Dominant wavelength</td>
<td>I_{F} = 10 mA</td>
<td>\lambda_{d}</td>
<td>562</td>
<td>571</td>
<td>575</td>
<td>nm</td>
</tr>
<tr>
<td>Peak wavelength</td>
<td>I_{F} = 10 mA</td>
<td>\lambda_{P}</td>
<td>-</td>
<td>565</td>
<td>-</td>
<td>nm</td>
</tr>
<tr>
<td>Angle of half intensity</td>
<td>I_{F} = 10 mA</td>
<td>\phi</td>
<td>-</td>
<td>\pm 60</td>
<td>-</td>
<td>deg</td>
</tr>
<tr>
<td>Forward voltage per diode</td>
<td>I_{F} = 20 mA</td>
<td>V_{F}</td>
<td>-</td>
<td>2.2</td>
<td>3</td>
<td>V</td>
</tr>
<tr>
<td>Reverse current per diode</td>
<td>V_{R} = 6 V</td>
<td>I_{R}</td>
<td>-</td>
<td>-</td>
<td>10 \mu A</td>
<td></td>
</tr>
<tr>
<td>Junction capacitance per diode</td>
<td>V_{R} = 0 V, f = 1 MHz</td>
<td>C_{J}</td>
<td>-</td>
<td>15</td>
<td>-</td>
<td>pF</td>
</tr>
</tbody>
</table>

Note  
(1) In one packing unit I_{Vmax}/I_{Vmin} \leq 1.6
**LUMINOUS INTENSITY CLASSIFICATION**

<table>
<thead>
<tr>
<th>GROUP</th>
<th>STANDARD</th>
<th>OPTIONAL</th>
<th>MIN.</th>
<th>MAX.</th>
</tr>
</thead>
<tbody>
<tr>
<td>H</td>
<td>1</td>
<td>2.8</td>
<td>3.55</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>3.55</td>
<td>4.5</td>
<td></td>
</tr>
<tr>
<td>J</td>
<td>1</td>
<td>4.5</td>
<td>5.6</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>5.6</td>
<td>7.1</td>
<td></td>
</tr>
<tr>
<td>K</td>
<td>1</td>
<td>7.1</td>
<td>9.0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>9.0</td>
<td>11.2</td>
<td></td>
</tr>
<tr>
<td>L</td>
<td>1</td>
<td>11.2</td>
<td>14.0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>14.0</td>
<td>18.0</td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>1</td>
<td>18.0</td>
<td>22.4</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>22.4</td>
<td>28.0</td>
<td></td>
</tr>
</tbody>
</table>

**COLOR CLASSIFICATION**

<table>
<thead>
<tr>
<th>GROUP</th>
<th>GREEN</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>DOM. WAVELENGTH (nm)</td>
</tr>
<tr>
<td></td>
<td>MIN.</td>
</tr>
<tr>
<td>3</td>
<td>562</td>
</tr>
<tr>
<td>4</td>
<td>564</td>
</tr>
<tr>
<td>5</td>
<td>566</td>
</tr>
<tr>
<td>6</td>
<td>568</td>
</tr>
<tr>
<td>7</td>
<td>570</td>
</tr>
<tr>
<td>8</td>
<td>572</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 will 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 will not be orderable.

**TYPICAL CHARACTERISTICS** \((T_{amb} = 25 \degree C, \text{ unless otherwise specified})\)

![Fig. 1 - Forward Current vs. Ambient Temperature](image1)

![Fig. 2 - Pulse Forward Current vs. Pulse Duration](image2)
Fig. 3 - Relative Luminous Intensity vs. Angular Displacement

Fig. 4 - Relative Intensity vs. Wavelength

Fig. 5 - Relative Intensity vs. Wavelength

Fig. 6 - Forward Current vs. Forward Voltage

Fig. 7 - Forward Current vs. Forward Voltage

Fig. 8 - Relative Luminous Intensity vs. Forward Current
Fig. 9 - Relative Luminous Intensity vs. Forward Current

Fig. 10 - Relative Luminous Intensity vs. Ambient Temperature

Fig. 11 - Relative Luminous Intensity vs. Ambient Temperature

Fig. 12 - Relative Luminous Intensity vs. Forward Current/Duty Cycle

Fig. 13 - Specific Luminous Intensity vs. Forward Current
METHOD OF TAPE/POLARITY AND TAPE AND REEL

SMD LED (VLM.3 - SERIES)

Vishay’s LEDs in SMD packages are available in an antistatic 8 mm blister tape (in accordance with DIN IEC 40 (CO) 564) for automatic component insertion. The blister tape is a plastic strip with impressed component cavities, covered by a top tape.

TAPING OF VLM.3...

Fig. 14 - Tape Dimensions in mm for PLCC-2
REEL PACKAGE DIMENSION IN MILLIMETERS FOR SMD LEDS, TAPE OPTION GS08 (≈ 1500 PCS.)

Identification
Label: Vishay type group tape code production code quantity

REEL PACKAGE DIMENSION IN MILLIMETERS FOR SMD LEDS, TAPE OPTION GS18 (≈ 8000 PCS.) PREFERRED

Identification
Label: Vishay type group tape code production code quantity

SOLDERING PROFILE

IR Reflow Soldering Profile for lead (Pb)-free soldering
Preconditioning acc. to JEDEC level 2a
max. 260 °C
max. 2 cycles allowed
max. 260 °C
max. 120 s
max. ramp down 6 °C/s
max. ramp up 3 °C/s
255 °C
240 °C
245 °C
max. 30 s

TTW Soldering (acc. to CECC00802)

forced cooling
ca. 5 K/s
ca. 2 K/s
100 °C to 130 °C
ca. 200 K/s
235 °C to 260 °C
100 °C
2 K/s
120 °C
5 s

Fig. 15 - Reel Dimensions - GS08

Fig. 16 - Reel Dimensions - GS18

Fig. 17 - Vishay Lead (Pb)-free Reflow Soldering Profile (acc. to J-STD-020)

Fig. 18 - Double Wave Soldering of Opto Devices (all Packages)
**BAR CODE PRODUCT LABEL** (example)

A. Type of component
B. Manufacturing plant
C. SEL - selection code (bin):
   e.g.:  H2 = code for luminous intensity group
   3 = code for color 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 aluminium
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 672 h 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 2a 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. Electro-static
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.
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