Data Sheet
3528 SMD LED
Nationstar LED
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General Informations:

Features:

- Silicone encapsulation
- Pb-free reflow soldering
- High luminous intensity
- Low power dissipation
- Good reliability and long life
- Various colors
- Good color uniformity
- Lead free reflow soldering
- RoHS compliant

Application:

- Reading lights (car, bus, aircraft)
- Portable (flashlight, bicycle)
- Uplighters/Downlighters
- Decorative/Entertainment
- Bollards/Security/Garden
- Cove/Undershelf/Task
- Indoor/Outdoor Commercial and
- Residential Architectural
- Automotive Ext (Stop-Tail-Turn),
- CHMSL, Mirror Side Repeat
- LCD backlights
- Numerous lightening applications
# Electrical and Flux Characteristics

**Table 1: Flux Characteristics**

<table>
<thead>
<tr>
<th>Code</th>
<th>Size(mm)</th>
<th>Case</th>
<th>Color</th>
<th>Wavelength</th>
<th>Angle</th>
</tr>
</thead>
<tbody>
<tr>
<td>4005</td>
<td>3528</td>
<td>SMD LED</td>
<td>Red</td>
<td>615-630 nm</td>
<td>110°</td>
</tr>
<tr>
<td>4006</td>
<td>3528</td>
<td>SMD LED</td>
<td>Yellow</td>
<td>585-596 nm</td>
<td>110°</td>
</tr>
<tr>
<td>4004</td>
<td>3528</td>
<td>SMD LED</td>
<td>Blue</td>
<td>463-472 nm</td>
<td>110°</td>
</tr>
<tr>
<td>4003</td>
<td>3528</td>
<td>SMD LED</td>
<td>Green</td>
<td>515-535 nm</td>
<td>110°</td>
</tr>
<tr>
<td>4002</td>
<td>3528</td>
<td>SMD LED</td>
<td>White</td>
<td>5500-6500K</td>
<td>120°</td>
</tr>
<tr>
<td>4002-1</td>
<td>3528</td>
<td>SMD LED</td>
<td>White</td>
<td>7200-8500K</td>
<td>120°</td>
</tr>
<tr>
<td>4001</td>
<td>3528</td>
<td>SMD LED</td>
<td>Warm White</td>
<td>2800-3200K</td>
<td>120°</td>
</tr>
<tr>
<td>4024</td>
<td>3528</td>
<td>SMD LED</td>
<td>Cold White</td>
<td>6000K</td>
<td>120°</td>
</tr>
<tr>
<td>4025</td>
<td>3528</td>
<td>SMD LED</td>
<td>Warm White</td>
<td>3000K</td>
<td>120°</td>
</tr>
</tbody>
</table>

Notes for Table 1:
1. Parts are tested in pulsed conditions, Tj = 25°C. Pulse width is 10 ms at rated test current.
2. İlker Elektronik maintains a ± 10% tolerance on flux measurements.
3. Typical R9 value for 80CRI can be changed with 90CRI.
4. Center beam candle power is a calculated value based on Lambertian radiation pattern at nominal test current.

**Table 2: Electrical Characteristics**

<table>
<thead>
<tr>
<th>Code</th>
<th>Color</th>
<th>Typical Forward Current (mA)</th>
<th>Max Forward Current (mA)</th>
<th>Typical Input Voltage (CV)</th>
<th>Max Input Voltage (CV)</th>
<th>Typical Lm</th>
<th>Max Lm</th>
</tr>
</thead>
<tbody>
<tr>
<td>4005</td>
<td>Red</td>
<td>20mA</td>
<td>25mA</td>
<td>2.0V</td>
<td>2.6V</td>
<td>590 mcd</td>
<td>850 mcd</td>
</tr>
<tr>
<td>4006</td>
<td>Yellow</td>
<td>20mA</td>
<td>25mA</td>
<td>2.0V</td>
<td>2.6V</td>
<td>500 mcd</td>
<td>900 mcd</td>
</tr>
<tr>
<td>4004</td>
<td>Blue</td>
<td>20mA</td>
<td>25mA</td>
<td>3.2V</td>
<td>3.6V</td>
<td>330 mcd</td>
<td>600 mcd</td>
</tr>
<tr>
<td>4003</td>
<td>Green</td>
<td>20mA</td>
<td>25mA</td>
<td>3.2V</td>
<td>3.6V</td>
<td>900 mcd</td>
<td>1800 mcd</td>
</tr>
<tr>
<td>4002</td>
<td>White</td>
<td>20mA</td>
<td>25mA</td>
<td>3.3V</td>
<td>3.6V</td>
<td>3000 mcd</td>
<td>3600 mcd</td>
</tr>
<tr>
<td>4002-1</td>
<td>White</td>
<td>20mA</td>
<td>25mA</td>
<td>3.2V</td>
<td>3.6V</td>
<td>2400 mcd</td>
<td>3300 mcd</td>
</tr>
<tr>
<td>4001</td>
<td>Warm White</td>
<td>20mA</td>
<td>25mA</td>
<td>3.2V</td>
<td>3.6V</td>
<td>2700 mcd</td>
<td>3600 mcd</td>
</tr>
<tr>
<td>4024</td>
<td>Cold White</td>
<td>150mA</td>
<td>200mA</td>
<td>3.3V</td>
<td>3.6V</td>
<td>24000mcd (52 Lm)</td>
<td>24000 mcd</td>
</tr>
<tr>
<td>4025</td>
<td>Warm White</td>
<td>150mA</td>
<td>200mA</td>
<td>3.3V</td>
<td>3.6V</td>
<td>20000mcd (45 Lm)</td>
<td></td>
</tr>
</tbody>
</table>

Notes for Table 2:
1. Parts are tested in pulsed conditions, Tj = 25°C. Pulse width is 10 ms at rated test current.
2. İlker Elektronik maintains a ± 10% tolerance on current values.
3. Typical stabilized DC performance values are provided as reference only and are not a guarantee of performance.
Absolute Maximum Ratings ($T_A = 25^\circ C$ unless otherwise noted)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Maximum Performance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Storage Temperature Range</td>
<td>-40 ~ +100° C</td>
</tr>
<tr>
<td>Operating Temperature Range</td>
<td>-30 ~ +85° C</td>
</tr>
<tr>
<td>Mounting Surface Temperature</td>
<td>60° C</td>
</tr>
<tr>
<td>LED Junction Temperature$^1$</td>
<td>125° C</td>
</tr>
<tr>
<td>Electrostatic Discharge Classification</td>
<td>Class 1C</td>
</tr>
<tr>
<td>Reverse Voltage$^{[2,3]}$</td>
<td>-5V</td>
</tr>
<tr>
<td>UL Recognition</td>
<td>UL recognized</td>
</tr>
</tbody>
</table>

Notes for Table 3:
1. Proper current de-rating must be observed to maintain junction temperature below the maximum.
2. Power LEDs are not designed to be driven in reverse bias.
3. At maximum reverse current of 10μA/LED.

Application Notes:

- The Anode side of the device is denoted by a hole in the lead frame.
- Electrical insulation between the case and the board is required. Do not electrically connect either the anode or cathode to the slug.
- Drawing not to scale.
- All dimensions are in millimeters.
- Unless otherwise indicated, tolerances are ± 0.20mm.
- Please do not bend the leads of the LED, otherwise it will damage the LED.

Precautions:

- Current should be derated in order to keep junction temperature below maximum by reducing power dissipation.
- Current spikes should be avoided especially during power up. It is good practice to initially connect PCB to unactivated supply, then gradually ramp up voltage to desired value.
- Proper management of the thermal path should be observed. Adequate heatsinking of strip should be provided in order to maintain junction temperature below maximum. Proper thermal conduction layers should be introduced at all interfaces to prevent insulating air gaps in the thermal path.
- As with all semiconductor devices, it is good practice to avoid electrostatic discharge (ESD).
Color Wavelength Diagram:

LED Color Spectrum for Red, Green, Blue, Yellow:

![LED Color Spectrum for Red, Green, Blue, Yellow](image1)

LED Color Spectrum for White (80 CRI):

![LED Color Spectrum for White (80 CRI)](image2)

**DO NOT LOOK DIRECTLY AT LED WITH UNSHIELDED EYES OR DAMAGE TO RETINA MAY OCCUR.**
Mechanical Dimensions:

Technical Drawing:

4001-4003

4003-4005

4024-4025

Electrical Connection:

Circuit Diagram:
Optical Characteristics:

![Radiation diagram](image)

Relative luminous intensity $I_v \%$

**LED Light distribution**

Packing:

- **Cardboard Box**