Data Sheet

AM321A_RE

Part Number : SPMRDT3215A0

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Introduction

Part Number : SPMRDT3215A0
Compact Power Lighting Source

Features
• Package: Ag plated 2 pad design package with silicone resin
• View Angle : 120°
• Typical wavelength : 620nm
• Optical efficiency : 60 lm/W
• Precondition : JEDEC Level 2a
• ESD Withstanding Voltage : up to ±2kV [HBM]

Applications
• traffic lights
• back lighting (LCD, switches, keys, displays, illuminated advertising)
• interior and exterior automotive lighting
• substitution of micro incandescent lamps
• marker lights (e.g. steps, exit ways, etc.)
• signal and symbol luminaire

Environmental Compliance
Samsung is compliant to the restrictions of hazardous substances in electronic equipment, namely, the RoHS, ELV, ISO14001 and REACH directives. Samsung will not intentionally supplement the restricted materials to the LED product: Cd,Pb,Hg,PBBs,PBDEs and Cr⁶⁺
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Part Number Description

The Part number designation is explained as follows:

SP M RD T 321 5 A 0 AB CD EF
AB C DE F GHI J K L MN OP QR

Where:

AB - designates company name and Samsung LED PKG (SP for Samsung LED PKG)
C - designates power variant (M for automotive Middle Power)
DE - designates color variant (RD for automotive RED and single color)
F - designates LED PKG version (value T for initial version)
GHI - designates product configuration and type
J - designates operating condition (value 5 for 50mA)
K - designates specific property
L - designates CRI variant (value 0 for discrete color)
MN - designates forward voltage property
OP - designates dominant wavelength property
QR - designates luminous intensity property
### Characteristics

#### Typical Characteristics

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forward voltage (I_F = 50 mA)</td>
<td>V_F</td>
<td>2.20</td>
<td>V</td>
</tr>
<tr>
<td>Reverse current (V_R = 5 V)</td>
<td>I_R</td>
<td>10</td>
<td>μA</td>
</tr>
<tr>
<td>Peak wavelength (I_F = 50 mA)</td>
<td>λ_Peak</td>
<td>620</td>
<td>nm</td>
</tr>
<tr>
<td>Dominant wavelength (I_F = 50 mA)</td>
<td>λ_Dom</td>
<td>619.5</td>
<td>nm</td>
</tr>
<tr>
<td>Spectral bandwidth at half maximum</td>
<td>Δλ</td>
<td>16</td>
<td>nm</td>
</tr>
<tr>
<td>Temperature coefficient of peak wavelength</td>
<td>TCλ_Peak</td>
<td>0.13</td>
<td>nm/K</td>
</tr>
<tr>
<td>(I_F = 50 mA, -30°C ≤ T ≤ 80°C)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temperature coefficient of dominant</td>
<td>TCλ_Dom</td>
<td>0.07</td>
<td>nm/K</td>
</tr>
<tr>
<td>wavelength (I_F = 50 mA, -30°C ≤ T ≤ 80°C)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temperature coefficient of forward voltage</td>
<td>TC_V</td>
<td>-2.26</td>
<td>mV/K</td>
</tr>
<tr>
<td>(I_F = 50 mA, -30°C ≤ T ≤ 80°C)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thermal resistance (Junction to Solder point)</td>
<td>R_th_J-S (Elec.)</td>
<td>67</td>
<td>K/W</td>
</tr>
</tbody>
</table>

#### Luminous Intensity Bin

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Condition</th>
<th>Bin Code</th>
<th>Luminous Intensity (I_V) [cd]</th>
<th>Luminous Flux (Φ_V) [lm]</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>I_F = 50mA</td>
<td></td>
<td>Min.</td>
<td>Max.</td>
</tr>
<tr>
<td>(I_V, Φ_V)</td>
<td></td>
<td>BA</td>
<td>1.8</td>
<td>2.24</td>
</tr>
<tr>
<td></td>
<td></td>
<td>BB</td>
<td>2.24</td>
<td>2.80</td>
</tr>
<tr>
<td></td>
<td></td>
<td>CA</td>
<td>2.80</td>
<td>3.55</td>
</tr>
</tbody>
</table>

*Note


[2] Luminous intensity measuring equipment : CAS140CT

\(I_V\) and \(V_F\) tolerances are ±10% and ±0.1 V, respectively.

[3] Luminous flux value is just reference purposes. LED are sorted by the value of luminous intensity.
### Forward Voltage Bin\[^{[4]}\]

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Condition</th>
<th>Bin Code</th>
<th>Min.</th>
<th>Typ.</th>
<th>Max.</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>(V_F)</td>
<td>(I_F = 50,mA)</td>
<td>E1</td>
<td>1.9</td>
<td>-</td>
<td>2.05</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>E2</td>
<td>2.05</td>
<td>-</td>
<td>2.2</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>E3</td>
<td>2.20</td>
<td>-</td>
<td>2.35</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>E4</td>
<td>2.35</td>
<td>-</td>
<td>2.5</td>
<td></td>
</tr>
</tbody>
</table>

### Dominant Wavelength Bin\[^{[4]}\]

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Condition</th>
<th>Bin Code</th>
<th>Min.</th>
<th>Typ.</th>
<th>Max.</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>(\lambda_D)</td>
<td>(I_F = 50,mA)</td>
<td>C1</td>
<td>615.0</td>
<td>-</td>
<td>619.5</td>
<td>nm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>C2</td>
<td>619.5</td>
<td>-</td>
<td>624.0</td>
<td></td>
</tr>
</tbody>
</table>

* Note

\[^{[4]}\] Wavelength measuring equipment : CAS140CT

  tolerance ±2 nm
### Absolute Maximum Ratings

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating temperature range</td>
<td>$T_{OPR}$</td>
<td>-40 ~ 100</td>
<td>°C</td>
</tr>
<tr>
<td>Storage temperature range</td>
<td>$T_{STG}$</td>
<td>-40 ~ 100</td>
<td>°C</td>
</tr>
<tr>
<td>Junction temperature</td>
<td>$T_{J\text{,Max.}}$</td>
<td>125</td>
<td>°C</td>
</tr>
<tr>
<td>Maximum forward current$^{[5]}$</td>
<td>$I_F$</td>
<td>70</td>
<td>mA</td>
</tr>
<tr>
<td>(TJ : 25 ℃)$^{[6]}$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Minimum forward current$^{[5]}$</td>
<td>$I_F$</td>
<td>5</td>
<td>mA</td>
</tr>
<tr>
<td>(TJ : 25 ℃)$^{[6]}$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maximum peaked current</td>
<td>$I_{FM}$</td>
<td>100</td>
<td>mA</td>
</tr>
<tr>
<td>(TJ : 25 ℃)$^{[6]}$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reverse voltage</td>
<td>$V_R$</td>
<td>5</td>
<td>V</td>
</tr>
<tr>
<td>(TJ : 25 ℃)$^{[6]}$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power consumption</td>
<td>$P_{TOT}$</td>
<td>180</td>
<td>mW</td>
</tr>
<tr>
<td>(TJ : 25 ℃)$^{[6]}$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ESD sensitivity(HBM)</td>
<td>-</td>
<td>±2</td>
<td>kV</td>
</tr>
</tbody>
</table>

* Notes

$^{[5]}$ Unpredictable performance may be resulted by driving the product at below Min. $I_F$ or above Max. $I_F$.

$^{[6]}$ The measurement condition means that temperature dependence is excluded by applying pulse current for under 25 ms.
Typical Characteristics Graph

- **Typical Spectrum**
  :  \( I_F = 50 \text{ mA}, T_J = 25^\circ\text{C}\)\[6\]

- **Wavelength Shift vs Angle**
  :  \( I_F = 50 \text{ mA}, T_J = 25^\circ\text{C}\)\[6\]
• Relative Luminous Intensity & Forward Voltage vs Forward Current
  : $T_J = 25^\circ\text{C}^{[6]}$

![Graph of Relative Luminous Intensity vs Forward Current](image1)

![Graph of Forward Voltage vs Forward Current](image2)

• Wavelength Shift vs Forward Current
  : Reference point $I_F = 50$ mA, $T_J = 25^\circ\text{C}^{[6]}$

![Graph of Wavelength Shift vs Forward Current](image3)
• Relative Luminous Intensity & Forward Voltage vs Temperature
  - Reference point_25°C, $I_F = 50$ mA

![Graph of Relative Luminous Intensity vs Case Temperature](image1)

![Graph of Forward Voltage vs Case Temperature](image2)

• Wavelength Shift vs Temperature
  - Reference point_25°C, $I_F = 50$ mA

![Graph of Wavelength Shift vs Case Temperature](image3)
• Typical Radiant Pattern
  \[ I_F = 50 \text{ mA}, \quad T_J = 25^\circ C \]^{[6]}

• Max. Permissible Forward Current
  \[ I_F = f(T_c) \]
**Mechanical Dimension**

* Note

[7] Unit : mm, Tolerance : ±0.10mm

Do not place pressure on the encapsulating resin (hatch area)
The maximum compressing force is 15N on the polymer

- Electric Schematic Diagram
Soldering Information

- Pad Configuration & Solder Pad Layout

* Note

[8] Unit : mm, Tolerance : ±0.10mm

- Reflow Soldering Condition (Pb Free)
  Reflow Frequency : 2 times max.

- Manual Soldering Condition
  Not more than 5 seconds @ MAX 300 °C, under soldering iron.(one time only)
Packing Information

• Taping\[9\]

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
<th>I</th>
<th>J</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.0±0.10</td>
<td>4.0±1.0</td>
<td>2.0± 0.05</td>
<td>1.75± 0.10</td>
<td>5.5± 0.05</td>
<td>12.0± 0.10</td>
<td>3.2± 0.10</td>
<td>3.83± 0.10</td>
<td>0.23± 0.02</td>
<td>2.17± 0.10</td>
</tr>
</tbody>
</table>

* Not

\[9\] Unit : mm, Cumulative tolerance/10 pitches to be ±0.2mm
LED taping quantity : 2,000EA / Reel.
Adhesion Strength of Cover Tape : Adhesion strength to be 0.1-0.7N when the cover tape is
turned off from the carrier tape at 10° angle to be the carrier tape.

• Reel\[10\]

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
<th>W1</th>
<th>W2</th>
</tr>
</thead>
<tbody>
<tr>
<td>180.0</td>
<td>60± 1.0</td>
<td>13.0± 0.3</td>
<td>13.0± 0.5</td>
<td>15.4± 1.0</td>
</tr>
</tbody>
</table>

\[10\] Unit : mm
• Packing Box information

Dimension of Transportation Box in mm

<table>
<thead>
<tr>
<th>Width</th>
<th>Length</th>
<th>Height</th>
<th>Reels/box</th>
</tr>
</thead>
<tbody>
<tr>
<td>245</td>
<td>220</td>
<td>182</td>
<td>Up to 10 Reels</td>
</tr>
<tr>
<td>245</td>
<td>220</td>
<td>86</td>
<td>Up to 5 Reels</td>
</tr>
</tbody>
</table>

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Product Labeling Information

• Label Information

![Label Diagram]

1. Bin Code
   - AB: Forward Voltage ($V_F$) Bin
   - CD: Dominant Wavelength ($\lambda_D$) Bin
   - EF: Luminous Intensity ($I_v$) Bin

2. Lot No.
   - ①②③④⑤⑥⑦⑧⑨: Production Site (S:SAMSUNG KOREA, G:TIANJIN CHINA)
   - ①: Production Site (S:SAMSUNG KOREA, G:TIANJIN CHINA)
   - ②: L (LED)
   - ③: Product State (A:Normality, B:Bulk, C:First Production, R:Reproduction, S:Sample)
   - ⑤: Month (1 ~ 9, A, B, C)
   - ⑥: Day (1 ~ 9, A, B ~ V)
   - ⑦⑧⑨: SAMSUNG ELECTRONICS Product number (1 ~ 999)
   - ⑩⑪⑫: Reel Number (1 ~ 999)
For detailed Information please contact your SAMSUNG Sales partner
Precaution for Use

1) For over-current-proof function, customers are recommended to apply resistors to prevent sudden change of the current caused by slight shift of the voltage.

2) This device should not be used in any type of fluid such as water, oil, organic solvent, etc. When washing is required, IPA is recommended to use.

3) When the LEDs illuminate, operating current should be decided after considering the ambient maximum temperature.

4) LEDs must be stored in a clean environment.
   If the LEDs are to be stored for 3 months or more after being shipped from Samsung Electronics, they should be packed by a sealed container with nitrogen gas injected.(Shelf life of sealed bags: 12 months, temp. ~40 °C, ~90 % RH)

5) After storage bag is open, device subjected to soldering, solder reflow, or other high temperature processes must be:
   a. Mounted within 672 hours (28 days) at an assembly line with a condition of no more than 30 °C/60 %RH,
   b. Stored at <10 %RH.

6) Repack unused Products with anti-moisture packing, fold to close any opening and then store in a dry place.

7) Devices require baking before mounting, if humidity card reading is >60 % at 23±5 °C.

8) Devices must be baked for 1 day at 65±5 °C, if baking is required.

9) The LEDs are sensitive to the static electricity and surge. It is recommended to use a wrist band or anti-electrostatic glove when handling the LEDs.

   If voltage exceeding the absolute maximum rating is applied to LEDs, it may cause damage or even destruction to LED devices.

   Damaged LEDs may show some unusual characteristics such as increase in leak current, lowered turn-on voltage, or abnormal lighting of LEDs at low current.
10) VOCs (volatile organic compounds) may be occurred by adhesives, flux, hardener or organic additives which is used in luminaires (fixture) and LED silicone bags are permeable to it. It may lead a discoloration when LED expose to heat or light.

This phenomenon can give a significant loss of light emitted (output) from the luminaires (fixtures).

In order to prevent these problems, we recommend you to know the physical properties for the materials used in luminaires, It requires to select carefully.

11) Risk of Sulfurization (or Tarnishing)
The lead frame from Samsung Electronics is a plated package and it may change to black (or dark colored) when it is exposed to Ag (a), Sulfur (S), Cchlorine (Cl) or other halogen compound. It requires attention.

Sulfide (Sulfurization) of the lead frame may cause a change of degradation intensity, chromaticity coordinates and it may cause open circuit in extreme cases. It requires attention.

Sulfide (Sulfurization) of the lead frame may cause of storage and using with oxidizing substances together. Therefore, LED is not recommend to use and store with the below list.
: Rubber, Plain paper, lead solder cream etc
### Revision History

<table>
<thead>
<tr>
<th>Date</th>
<th>Revision History</th>
<th>Author</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010.10.18</td>
<td>Initial Edition</td>
<td>W.H. Junh</td>
</tr>
<tr>
<td>2012.10.08</td>
<td>Specification format change</td>
<td>J.C. Kang</td>
</tr>
<tr>
<td>2012.11.07</td>
<td>Electric Schematic incorrect change</td>
<td>J.C. Kang</td>
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<tr>
<td>2013.02.15</td>
<td>Precaution Revision</td>
<td>J.C. Kang</td>
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<tr>
<td>2014.01.27</td>
<td>Addition of box size</td>
<td>J.C. Kang</td>
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<tr>
<td>2015.08.03</td>
<td>Modify of Packing Information</td>
<td>S.Y. Hong</td>
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</tbody>
</table>

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