APTF1616SEJ3ZGGVBDC
1.6 x 1.6 mm Full-Color Surface Mount LED

DESCRIPTIONS
- The Hyper Red device is based on light emitting diode chip made from AlGaInP
- The Green source color devices are made with InGaN on Sapphire Light Emitting Diode
- The Blue source color devices are made with InGaN Light Emitting Diode
- Electrostatic discharge and power surge could damage the LEDs
- It is recommended to use a wrist band or anti-electrostatic glove when handling the LEDs
- All devices, equipments and machineries must be electrically grounded

FEATURES
- 1.6 mm x 1.6 mm SMD LED, 0.7 mm thickness
- Low power consumption
- Can produce any color in visible spectrum, including white light
- Package: 2000 pcs / reel
- Moisture sensitivity level: 3
- RoHS compliant

APPLICATIONS
- Backlight
- Status indicator
- Home and smart appliances
- Wearable and portable devices
- Healthcare applications

ATTENTION
Observe precautions for handling electrostatic discharge sensitive devices

PACKAGE DIMENSIONS

PACKAGING DIMENSIONS

RECOMMENDED SOLDERING PATTERN

Notes:
1. All dimensions are in millimeters (inches).
2. Tolerance is ±0.2(0.008") unless otherwise noted.
3. The specifications, characteristics and technical data described in the datasheet are subject to change without prior notice.
4. The device has a single mounting surface. The device must be mounted according to the specifications.

SELECTED GUIDES

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Emitting Color (Material)</th>
<th>Lens Type</th>
<th>Iv (mcd) @ 20mA</th>
<th>Viewing Angle</th>
</tr>
</thead>
<tbody>
<tr>
<td>APTF1616SEJ3ZGGVBDC</td>
<td>Hyper Red (AlGaInP)</td>
<td>Water Clear</td>
<td>200</td>
<td>360</td>
</tr>
<tr>
<td></td>
<td>Green (InGaN)</td>
<td></td>
<td>500</td>
<td>750</td>
</tr>
<tr>
<td></td>
<td>Blue (InGaN)</td>
<td></td>
<td>80</td>
<td>140</td>
</tr>
</tbody>
</table>

Notes:
1. θ1/2 is the angle from optical centerline where the luminous intensity is 1/2 of the optical peak value.
2. Luminous intensity / luminous flux: ±15%
3. Luminous intensity value is traceable to CIE127-2007 standards.
### ELECTRICAL / OPTICAL CHARACTERISTICS at \( T_A = 25°C \)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Emitting Color</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wavelength at Peak Emission ( I_F = 20mA )</td>
<td>( \lambda_{\text{peak}} )</td>
<td>Hyper Red</td>
<td>640</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Green</td>
<td>520</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Blue</td>
<td>465</td>
</tr>
<tr>
<td>Dominant Wavelength ( I_F = 20mA )</td>
<td>( \lambda_{\text{dom}} )</td>
<td>Hyper Red</td>
<td>625</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Green</td>
<td>525</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Blue</td>
<td>470</td>
</tr>
<tr>
<td>Spectral Bandwidth at 50% ( \Phi ) REL MAX ( I_F = 20mA )</td>
<td>( \Delta \lambda )</td>
<td>Hyper Red</td>
<td>25</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Green</td>
<td>35</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Blue</td>
<td>22</td>
</tr>
<tr>
<td>Capacitance</td>
<td>( C )</td>
<td>Hyper Red</td>
<td>27</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Green</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Blue</td>
<td>100</td>
</tr>
<tr>
<td>Forward Voltage ( I_F = 20mA )</td>
<td>( V_F )</td>
<td>Hyper Red</td>
<td>2.2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Green</td>
<td>3.2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Blue</td>
<td>3.3</td>
</tr>
<tr>
<td>Reverse Current ( V_R = 5V )</td>
<td>( I_R )</td>
<td>Hyper Red</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Green</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Blue</td>
<td>50</td>
</tr>
<tr>
<td>Temperature Coefficient of ( \lambda_{\text{peak}} ) ( I_F = 20mA, -10°C \leq T \leq 85°C )</td>
<td>( TC_{\lambda_{\text{peak}}} )</td>
<td>Hyper Red</td>
<td>0.13</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Green</td>
<td>0.05</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Blue</td>
<td>0.04</td>
</tr>
<tr>
<td>Temperature Coefficient of ( \lambda_{\text{dom}} ) ( I_F = 20mA, -10°C \leq T \leq 85°C )</td>
<td>( TC_{\lambda_{\text{dom}}} )</td>
<td>Hyper Red</td>
<td>0.06</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Green</td>
<td>0.03</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Blue</td>
<td>0.03</td>
</tr>
<tr>
<td>Temperature Coefficient of ( V_F ) ( I_F = 20mA, -10°C \leq T \leq 85°C )</td>
<td>( TC_{V} )</td>
<td>Hyper Red</td>
<td>-2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Green</td>
<td>-3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Blue</td>
<td>-3</td>
</tr>
</tbody>
</table>

**Notes:**
1. The dominant wavelength \( \lambda_{d} \) above is the setup value of the sorting machine. (Tolerance \( \lambda_{d}: \pm 1nm \).)
2. Forward voltage: ±0.1V.
3. Wavelength value is traceable to CIE127-2007 standards.
4. Excess driving current and/or operating temperature higher than recommended conditions may result in severe light degradation or premature failure.

### ABSOLUTE MAXIMUM RATINGS at \( T_A = 25°C \)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Hyper Red</th>
<th>Green</th>
<th>Blue</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power Dissipation</td>
<td>( P_D )</td>
<td>84</td>
<td>120</td>
<td>120</td>
<td>mW</td>
</tr>
<tr>
<td>Reverse Voltage</td>
<td>( V_R )</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>V</td>
</tr>
<tr>
<td>Junction Temperature</td>
<td>( T_J )</td>
<td>115</td>
<td>115</td>
<td>115</td>
<td>°C</td>
</tr>
<tr>
<td>Operating Temperature</td>
<td>( T_{op} )</td>
<td>-40 to +85</td>
<td>-40 to +85</td>
<td>-40 to +85</td>
<td>°C</td>
</tr>
<tr>
<td>Storage Temperature</td>
<td>( T_{stg} )</td>
<td>-40 to +85</td>
<td>-40 to +85</td>
<td>-40 to +85</td>
<td>°C</td>
</tr>
<tr>
<td>DC Forward Current</td>
<td>( I_F )</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>mA</td>
</tr>
<tr>
<td>Peak Forward Current</td>
<td>( I_{FM} )</td>
<td>150</td>
<td>100</td>
<td>100</td>
<td>mA</td>
</tr>
<tr>
<td>Electrostatic Discharge Threshold (HBM)</td>
<td>-</td>
<td>3000</td>
<td>450</td>
<td>250</td>
<td>V</td>
</tr>
<tr>
<td>Thermal Resistance (Junction / Ambient)</td>
<td>( R_{th _JA} )</td>
<td>285</td>
<td>405</td>
<td>340</td>
<td>°C/W</td>
</tr>
<tr>
<td>Thermal Resistance (Junction / Solder point)</td>
<td>( R_{th _JS} )</td>
<td>195</td>
<td>285</td>
<td>225</td>
<td>°C/W</td>
</tr>
</tbody>
</table>

**Notes:**
1. 1/10 Duty Cycle, 0.1ms Pulse Width.
2. \( R_{th \_JA}, R_{th \_JS} \) Results from mounting on PC board FR4 (pad size ≥ 16 mm² per pad).
3. Relative humidity levels maintained between 40% and 60% in production area are recommended to avoid the build-up of static electricity – Ref JEDEC/JESD625-A and JEDEC/J-STD-033.
### TECHNICAL DATA

#### RELATIVE INTENSITY vs. WAVELENGTH

![Graph showing relative intensity vs. wavelength for Blue, Green, and Red]

- **Wave Length (nm)**: 350 to 800
- **Relative Intensity (a.u.)**: 0% to 100%
- **Temperature**: Ta = 25 °C

#### SPATIAL DISTRIBUTION

![Graph showing spatial distribution]

- **Ambient Temperature**: -90° to 90°
- **Forward Current**: 0 to 100 mA
- **Luminous Intensity Normalised at Ta = 25 °C**

### HYPER RED

#### Forward Current vs. Forward Voltage

![Graph showing forward current vs. forward voltage]

- **Forward Voltage (V)**: 1.5 to 2.5
- **Forward Current (mA)**: 0 to 50
- **Temperature**: Ta = 25 °C

#### Luminous Intensity vs. Forward Current

![Graph showing luminous intensity vs. forward current]

- **Forward Current (mA)**: 0 to 50
- **Luminous Intensity Normalised at 20 mA**
- **Temperature**: Ta = 25 °C

#### Forward Current Derating Curve

![Graph showing forward current derating curve]

- **Ambient Temperature (°C)**: -40 to 100
- **Luminous Intensity Normalised at Ta = 25 °C**

#### Luminous Intensity vs. Ambient Temperature

![Graph showing luminous intensity vs. ambient temperature]

- **Ambient Temperature (°C)**: -40 to 100
- **Luminous Intensity Normalised at Ta = 25 °C**

### GREEN

#### Forward Current vs. Forward Voltage

![Graph showing forward current vs. forward voltage]

- **Forward Voltage (V)**: 2.0 to 4.5
- **Forward Current (mA)**: 0 to 50
- **Temperature**: Ta = 25 °C

#### Luminous Intensity vs. Forward Current

![Graph showing luminous intensity vs. forward current]

- **Forward Current (mA)**: 0 to 50
- **Luminous Intensity Normalised at 20 mA**
- **Temperature**: Ta = 25 °C

#### Forward Current Derating Curve

![Graph showing forward current derating curve]

- **Ambient Temperature (°C)**: -40 to 100
- **Luminous Intensity Normalised at Ta = 25 °C**

#### Luminous Intensity vs. Ambient Temperature

![Graph showing luminous intensity vs. ambient temperature]

- **Ambient Temperature (°C)**: -40 to 100
- **Luminous Intensity Normalised at Ta = 25 °C**

### BLUE

#### Forward Current vs. Forward Voltage

![Graph showing forward current vs. forward voltage]

- **Forward Voltage (V)**: 2.0 to 4.0
- **Forward Current (mA)**: 0 to 50
- **Temperature**: Ta = 25 °C

#### Luminous Intensity vs. Forward Current

![Graph showing luminous intensity vs. forward current]

- **Forward Current (mA)**: 0 to 50
- **Luminous Intensity Normalised at 20 mA**
- **Temperature**: Ta = 25 °C

#### Forward Current Derating Curve

![Graph showing forward current derating curve]

- **Ambient Temperature (°C)**: -40 to 100
- **Luminous Intensity Normalised at Ta = 25 °C**

#### Luminous Intensity vs. Ambient Temperature

![Graph showing luminous intensity vs. ambient temperature]

- **Ambient Temperature (°C)**: -40 to 100
- **Luminous Intensity Normalised at Ta = 25 °C**
REFLOW SOLDERING PROFILE for LEAD-FREE SMD PROCESS

<table>
<thead>
<tr>
<th>Temperature (°C)</th>
<th>Time (sec)</th>
</tr>
</thead>
<tbody>
<tr>
<td>25°C</td>
<td>30s max</td>
</tr>
<tr>
<td>260°C max</td>
<td>10s max</td>
</tr>
<tr>
<td>3°C/s max</td>
<td></td>
</tr>
<tr>
<td>6°C/s max</td>
<td></td>
</tr>
<tr>
<td>150~200°C</td>
<td>60~120s</td>
</tr>
<tr>
<td>above 217°C</td>
<td>60~150s</td>
</tr>
</tbody>
</table>

Notes:
1. Don’t cause stress to the LEDs while it is exposed to high temperature.
2. The maximum number of reflow soldering passes is 2 times.
3. Reflow soldering is recommended. Other soldering methods are not recommended as they might cause damage to the product.

TAPE SPECIFICATIONS (units: mm)

- A-A Section
- φ1 Typ.
- 1.67 ± 0.1
- 0.23 ± 0.1
- 1.05 ± 0.1
- 1.8 ± 0.1

REEL DIMENSION (units: mm)

- 12 ± 0.5
- Φ178 ± 1
- Φ56
- Φ60
- 9 ± 0.2

PACKING & LABEL SPECIFICATIONS

User Direction of Feed -> Label
2,000pcs / Reel
1 Reel / Bag
30K / Box
60K / Box

PRECAUTIONARY NOTES

1. The information included in this document reflects representative usage scenarios and is intended for technical reference only.
2. The part number, type, and specifications mentioned in this document are subject to future change and improvement without notice. Before production usage customer should refer to the latest datasheet for the updated specifications.
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