3mm Photodiode
PD204-6C/L3

Features
• Fast response time
• High photo sensitivity
• Small junction capacitance
• Pb free
• This product itself will remain within RoHS compliant version.
• Compliance with EU REACH

Description
PD204-6C/L3 is a high speed and high sensitive PIN photodiode in a standard 3Φ plastic package.
The device is Spectrally matched to visible and infrared emitting diode.

Applications
• Automatic door sensor
• Copier
• Game machine
Device Selection Guide

<table>
<thead>
<tr>
<th>Chip Materials</th>
<th>Lens Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>Silicon</td>
<td>Black</td>
</tr>
</tbody>
</table>

Absolute Maximum Ratings \( (Ta=25{^\circ}C) \)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Rating</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reverse Voltage</td>
<td>( V_R )</td>
<td>32</td>
<td>V</td>
</tr>
<tr>
<td>Operating Temperature</td>
<td>( T_{opr} )</td>
<td>-25 ~ +85</td>
<td>℃</td>
</tr>
<tr>
<td>Storage Temperature</td>
<td>( T_{stg} )</td>
<td>-40 ~ +100</td>
<td>℃</td>
</tr>
<tr>
<td>Soldering Temperature(^{*1})</td>
<td>( T_{sol} )</td>
<td>260</td>
<td>℃</td>
</tr>
<tr>
<td>Power Dissipation at (or below) 25(^{\circ}) Free Air Temperature</td>
<td>( P_c )</td>
<td>150</td>
<td>mW</td>
</tr>
</tbody>
</table>

Notes: \(^{*1}\):Soldering time \( \leq 5 \) seconds.
Electro-Optical Characteristics (Ta=25°C)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Min.</th>
<th>Typ.</th>
<th>Max.</th>
<th>Unit</th>
<th>Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Range Of Spectral Bandwidth</td>
<td>( \lambda_{0.5} )</td>
<td>760</td>
<td>-----</td>
<td>1100</td>
<td>nm</td>
<td>-----</td>
</tr>
<tr>
<td>Wavelength Of Peak Sensitivity</td>
<td>( \lambda_p )</td>
<td>-----</td>
<td>940</td>
<td>-----</td>
<td>nm</td>
<td>( E_e=1\text{mW/cm}^2 \lambda_p=940\text{nm} )</td>
</tr>
<tr>
<td>Open-Circuit Voltage</td>
<td>( V_{OC} )</td>
<td>-----</td>
<td>0.42</td>
<td>-----</td>
<td>V</td>
<td>( E_e=1\text{mW/cm}^2 \lambda_p=940\text{nm} )</td>
</tr>
<tr>
<td>Short- Circuit Current</td>
<td>( I_{SC} )</td>
<td>-----</td>
<td>4.3</td>
<td>-----</td>
<td>( \mu A )</td>
<td>( E_e=1\text{mW/cm}^2 \lambda_p=940\text{nm} )</td>
</tr>
<tr>
<td>Reverse Light Current</td>
<td>( I_L )</td>
<td>3.9</td>
<td>6</td>
<td>-----</td>
<td>( \mu A )</td>
<td>( E_e=1\text{mW/cm}^2 \lambda_p=940\text{nm} )</td>
</tr>
<tr>
<td>Reverse Dark Current</td>
<td>( I_D )</td>
<td>-----</td>
<td>-----</td>
<td>10</td>
<td>nA</td>
<td>( E_e=0\text{mW/cm}^2 ) ( V_R=10\text{V} )</td>
</tr>
<tr>
<td>Reverse Breakdown Voltage</td>
<td>( V_{BR} )</td>
<td>32</td>
<td>170</td>
<td>-----</td>
<td>( \mu A )</td>
<td>( E_e=0\text{mW/cm}^2 ) ( I_n=100\mu\text{A} )</td>
</tr>
<tr>
<td>Total Capacitance</td>
<td>( C_t )</td>
<td>-----</td>
<td>10</td>
<td>-----</td>
<td>pF</td>
<td>( E_e=0\text{mW/cm}^2 ) ( V_R=5\text{V} ) ( f=1\text{MHz} )</td>
</tr>
<tr>
<td>Rise Time/ Fall Time</td>
<td>( t_r / t_f )</td>
<td>-----</td>
<td>10/10</td>
<td>-----</td>
<td>ns</td>
<td>( V_R=10\text{V} ) ( R_L=1000\Omega )</td>
</tr>
<tr>
<td>View Angle</td>
<td>2( \theta )/2</td>
<td>-----</td>
<td>45</td>
<td>-----</td>
<td>deg</td>
<td>( I_e=20\text{mA} )</td>
</tr>
</tbody>
</table>

Note:
- Tolerance of Luminous Intensity: ±10%
- Tolerance of Dominant Wavelength: ±1nm
- Tolerance of Forward Voltage: ±0.1V
Typical Electro-Optical Characteristics Curves

<table>
<thead>
<tr>
<th>Power Dissipation vs. Ambient Temperature</th>
<th>Spectral Sensitivity</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="PowerDissipation.png" alt="" /></td>
<td><img src="SpectralSensitivity.png" alt="" /></td>
</tr>
</tbody>
</table>

- **Power Dissipation** vs. Ambient Temperature
  - Ambient Temperature $T_a$ (°C)
  - Power Dissipation $P_d$ (mW)

- **Spectral Sensitivity**
  - Wavelength $\lambda$ (nm)
  - Relative Spectral Sensitivity

<table>
<thead>
<tr>
<th>Reverse Dark Current vs. Ambient Temperature</th>
<th>Reverse Light Current vs. $Ee$</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="ReverseDarkCurrent.png" alt="" /></td>
<td><img src="ReverseLightCurrent.png" alt="" /></td>
</tr>
</tbody>
</table>

- **Reverse Dark Current** vs. Ambient Temperature
  - Ambient Temperature $T_a$ (°C)
  - Reverse Dark Current (μA)

- **Reverse Light Current** vs. $Ee$
  - $Ee$ (mW/cm²)
  - $V_R=5V$
  - $\lambda=940nm$
Terminal Capacitance vs. Reverse Voltage

Response Time vs. Load Resistance

- **Terminal Capacitance (pF) vs. Reverse Voltage (V)**
  - **f = 1MHz**
  - **V_R = 5V**
  - **E_c = 0mW/cm²**

- **Response Time (μs) vs. Load Resistance (Ω)**
  - **V_R = 10V**
  - **T_a = 25°C**
Package Dimension

Note: Tolerances unless dimensions ±0.25mm
Packing Quantity Specification

1. 200~1000PCS/1Bag, 4Bags/1Box
2. 10Boxes/1Carton

Label Form Specification

- CPN: Customer's Product Number
- P/N: Product Number
- QTY: Packing Quantity
- CAT: Luminous Intensity Rank
- HUE: Dom. Wavelength Rank
- REF: Forward Voltage Rank
- LOT No: Lot Number
- X: Month
- Reference: Identify Label Number
1. Lead Forming
   - During lead formation, the leads should be bent at a point at least 3mm from the base of the epoxy bulb.
   - Lead forming should be done before soldering.
   - Avoid stressing the LED package during leads forming. The stress to the base may damage the LED’s characteristics or it may break the Photodiode.
   - Cut the LED leadframes at room temperature. Cutting the leadframes at high temperatures may cause failure of the Photodiode.
   - When mounting the Photodiode onto a PCB, the PCB holes must be aligned exactly with the lead position of the LED. If the Photodiode are mounted with stress at the leads, it causes deterioration of the epoxy resin and this will degrade the Photodiode.

2. Storage
   - The Photodiode should be stored at 30°C or less and 70%RH or less after being shipped from Everlight and the storage life limits are 3 months. If the Photodiode are stored for 3 months or more, they can be stored for a year in a sealed container with a nitrogen atmosphere and moisture absorbent material.
   - Please avoid rapid transitions in ambient temperature, especially, in high humidity environments where condensation can occur.

3. Soldering
   - Careful attention should be paid during soldering. When soldering, leave more then 3mm from solder joint to epoxy bulb, and soldering beyond the base of the tie bar is recommended.

   - Recommended soldering conditions:

<table>
<thead>
<tr>
<th>Hand Soldering</th>
<th>DIP Soldering</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temp. at tip of iron</td>
<td>300°C Max. (30W Max.)</td>
</tr>
<tr>
<td>Soldering time</td>
<td>3 sec Max.</td>
</tr>
<tr>
<td>Distance</td>
<td>3mm Min.(From solder joint to epoxy bulb)</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

   - Recommended soldering profile
- Avoiding applying any stress to the lead frame while the Photodiode are at high temperature particularly when soldering.
- Dip and hand soldering should not be done more than one time
- After soldering the Photodiode, the epoxy bulb should be protected from mechanical shock or vibration until the Photodiode return to room temperature.
- A rapid-rate process is not recommended for cooling the Photodiode down from the peak temperature.
- Although the recommended soldering conditions are specified in the above table, dip or handsoldering at the lowest possible temperature is desirable for the Photodiode.
- Wave soldering parameter must be set and maintain according to recommended temperature and dwell time in the solder wave.

4. Cleaning
   - When necessary, cleaning should occur only with isopropyl alcohol at room temperature for a duration of no more than one minute. Dry at room temperature before use.
   - Do not clean the Photodiode by the ultrasonic. When it is absolutely necessary, the influence of ultrasonic cleaning on the Photodiode depends on factors such as ultrasonic power and the assembled condition. Ultrasonic cleaning shall be pre-qualified to ensure this will not cause damage to the LED

5. Circuit Protection
   - Below the zener reference voltage Vz, all the current flows through LED and as the voltage rises to Vz, the zener diode “breakdown.” If the voltage tries to rise above Vz current flows through the zener branch to keep the voltage at exactly Vz.
   - When the LED is connected using serial circuit, if either piece of LED is no light up but current can’t flow through causing others to light down. In new design, the LED is parallel with zener diode. If either piece of LED is no light up but current can flow through causing others to light up.

6. Heat Management
   - Heat management of Photodiode must be taken into consideration during the design stage of LED application. The current should be de-rated appropriately by referring to the de-rating curve found in each product specification.
   - The temperature surrounding the LED in the application should be controlled. Please refer to the data sheet de-rating curve.

7. ESD (Electrostatic Discharge)
   - Electrostatic discharge (ESD) or surge current (EOS) can damage Photodiode
   - An ESD wrist strap, ESD shoe strap or antistatic gloves must be worn whenever handling Photodiode
   - All devices, equipment and machinery must be properly grounded.

   - Use ion blower to neutralize the static charge which might have built up on surface of the Photodiode plastic lens as a result of friction between Photodiode during storage and handing.
DISCLAIMER

1. EVERLIGHT reserves the right(s) on the adjustment of product material mix for the specification.
2. The product meets EVERLIGHT published specification for a period of twelve (12) months from date of shipment.
3. The graphs shown in this datasheet are representing typical data only and do not show guaranteed values.
4. When using this product, please observe the absolute maximum ratings and the instructions for using outlined in these specification sheets. EVERLIGHT assumes no responsibility for any damage resulting from the use of the product which does not comply with the absolute maximum ratings and the instructions included in these specification sheets.
5. These specification sheets include materials protected under copyright of EVERLIGHT. Reproduction in any form is prohibited without obtaining EVERLIGHT’s prior consent.
6. This product is not intended to be used for military, aircraft, automotive, medical, life sustaining or life saving applications or any other application which can result in human injury or death. Please contact authorized Everlight sales agent for special application request.