GaAlAs Plastic Infrared Emitting Diodes
Types OP293 and OP298 Series

Features
- Wide irradiance pattern (OP293 series)
- Narrow irradiance pattern (OP298 series)
- Mechanically and spectrally matched to the OP593 and OP598 series phototransistors
- Variety of power ranges
- Significantly higher power output than GaAs at equivalent drive currents
- Wavelength matched to silicon's peak response
- Low cost replacement for TO-46 hermetic package

Description
The OP293 and OP298 series devices are 890nm high intensity gallium aluminum arsenide infrared emitting diodes molded in IR transmissive packages. The broad irradiance pattern of the OP293 series provides relatively even illumination over a large area. The OP298 series is focused with an emission angle of 25°.

Absolute Maximum Ratings (T_A = 25°C unless otherwise noted)
- Reverse Voltage ........................................ 2.0 V
- Continuous Forward Current, Free Air .................. 100 mA(2)
- Continuous Forward Current, Board Mounted .......... 133 mA(3)
- Continuous Forward Current, Full Heat Sink .......... 200 mA(4)
- Peak Forward Current (25 μs pulse width) .............. 2.0 A
- Maximum Duty Cycle (250 μs pulse width, @ 2 A) .......... 5.0%
- Storage and Operating Temperature Range .......... -40°C to +100°C
- Lead Soldering Temperature [1/16 inch (1.6 mm) from case for 5 sec with soldering iron] .......... 260°C(1)
- Power Dissipation, Free Air .................................. 142 mW(2)
- Power Dissipation, Board Mounted ..................... 200 mW(3)
- Power Dissipation, Full Heat Sink .................... 400 mW(4)

Notes:
1. RMA flux is recommended. Duration can be extended to 10 sec max. when flow soldering. Max. 20 grams force may be applied to the leads when soldering.
2. Measured in Free-Air. Derate power dissipation linearly 1.43 mW/°C above 25°C.
3. Mounted on 1/16" (1.6 mm) thick PC board with each lead soldered through 80 mil square lands 0.250" (6.35 mm) below flange of device. Derate power dissipation linearly 2.00 mW/°C above 25°C. (Normal Use)
4. Immersed in silicone fluid to simulate infinite heat sink. Derate power dissipation linearly 2.50 mW/°C above 25°C.
5. Measurement is taken at the end of a single 100 μs pulse. Heating due to increased pulse rate or pulse width will cause a decrease in reading.
6. E_{(AP)} is a measurement of the average aperture radiant energy incident upon a sensing area 0.250" (6.35 mm) in diameter perpendicular to and centered on the mechanical axis of the lens and 0.420" (10.7 mm) from the measurement surface. E_{(AP)} is not necessarily uniform within the measured area.
7. Typical Total Power Out (P_T) @ I_T = 100 mA pulsed on OP293C = 13 mW; OP293B = 16 mW; OP293A = 22 mW.
8. E_{(APT)} is a measurement of the average aperture radiant energy incident upon a sensing area 0.250" (6.5 mm) in diameter perpendicular to and centered on the mechanical axis of the lens and 1.429" (36.30 mm) from the measurement surface. E_{(APT)} is not necessarily uniform within the measured area.
9. For press fit, drill 0.184 ± 0.001" diameter hole.
10. This dimension is held to within ± 0.005" on the flange edge and may vary ± 0.020" in the area of the leads.
11. Cathode lead is 0.070" nom shorter than anode lead.

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**Types OP293 and OP298 Series**

Electrical Characteristics ($T_A = 25^°C$ unless otherwise noted)

<table>
<thead>
<tr>
<th>SYMBOL</th>
<th>PARAMETER</th>
<th>MIN</th>
<th>TYP</th>
<th>MAX</th>
<th>UNITS</th>
<th>TEST CONDITIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>$E_{0}(APT)$</td>
<td>Apertured Radiant Incidence</td>
<td>OP293C</td>
<td>10</td>
<td>26</td>
<td>mW/cm$^2$</td>
<td>$I_F = 100$ mA(5)(6)(7)</td>
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<td></td>
<td></td>
<td>OP293B</td>
<td>13</td>
<td></td>
<td>mW/cm$^2$</td>
<td>$I_F = 100$ mA(5)(6)(7)</td>
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<tr>
<td></td>
<td></td>
<td>OP293A</td>
<td>16</td>
<td></td>
<td>mW/cm$^2$</td>
<td>$I_F = 100$ mA(5)(6)(7)</td>
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<tr>
<td></td>
<td>&quot;OP293 is measured with a $30^°$ cone angle at 0.420&quot; (10.67 mm)</td>
<td>OP298C</td>
<td>1.8</td>
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<td>mW/cm$^2$</td>
<td>$I_F = 100$ mA(5)(6)(7)</td>
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<td></td>
<td>OP298B</td>
<td>2.4</td>
<td></td>
<td>mW/cm$^2$</td>
<td>$I_F = 100$ mA(5)(6)(7)</td>
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<td></td>
<td>OP298A</td>
<td>3.0</td>
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<td>mW/cm$^2$</td>
<td>$I_F = 100$ mA(5)(6)(7)</td>
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<tr>
<td>$V_F$</td>
<td>Forward Voltage</td>
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<td>2.0</td>
<td></td>
<td>V</td>
<td>$I_F = 1.50$ A(5)</td>
</tr>
<tr>
<td>$I_R$</td>
<td>Reverse Current</td>
<td></td>
<td>100</td>
<td></td>
<td>$\mu$A</td>
<td>$V_R = 2$ V</td>
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<tr>
<td>$\lambda_P$</td>
<td>Wavelength at Peak Emission</td>
<td></td>
<td>890</td>
<td></td>
<td>nm</td>
<td>$I_F = 10$ mA</td>
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<tr>
<td>$B$</td>
<td>Spectral Bandwidth Between Half Power Points</td>
<td></td>
<td>80</td>
<td></td>
<td>nm</td>
<td>$I_F = 10$ mA</td>
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<td>$\Delta \lambda / \Delta T$</td>
<td>Spectral Shift with Temperature</td>
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<td>+0.18</td>
<td></td>
<td>nm/°C</td>
<td>$I_F =$ Constant</td>
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<tr>
<td>$\theta_{HP}$</td>
<td>Emission Angle at Half Power Points</td>
<td>OP293</td>
<td>60</td>
<td></td>
<td>Deg.</td>
<td>$I_F = 20$ mA</td>
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<tr>
<td></td>
<td></td>
<td>OP298</td>
<td>25</td>
<td></td>
<td>Deg.</td>
<td>$I_F = 20$ mA</td>
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<td>$t_r$</td>
<td>Output Rise Time</td>
<td></td>
<td>500</td>
<td></td>
<td>ns</td>
<td>$I_F(PK) = 100$ mA, PW = 10 $\mu$s, D.C. = 10%</td>
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<td>$t_f$</td>
<td>Output Fall Time</td>
<td></td>
<td>250</td>
<td></td>
<td>ns</td>
<td>$I_F(PK) = 100$ mA, PW = 10 $\mu$s, D.C. = 10%</td>
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</table>

**Typical Performance Curves**

1. **Percent Change in Radiant Intensity vs. Time**
   - $I_F = 1$ A, PW = 10 $\mu$s, 10 PPS
   - $I_F = 20$ mA DC
   - $I_F = 50$ mA DC
   - $I_F = 100$ mA DC
   - $I_F = 250$ mA DC

2. **Spectral Response and Emission vs. Wavelength**
   - Test Conditions (LED): $T_A = T_J = 25^°C$
   - $I_F = 100$ mA, DC = 0.1%
   - PW = 10 $\mu$s

3. **Rise and Fall Time vs. Forward Current**
   - Test Conditions: $T_A = T_J = 25^°C$
   - PW = 10 $\mu$s, DC = 0.1%
   - $t_f > 290$ mA $t > 300$ mA

4. **Shift in Peak Wavelength vs. Junction Temperature**
   - Test Conditions: $T_A = T_J$
   - PW = 10 $\mu$s, DC = 0.1%
   - $I_F = 100$ mA

Optek reserves the right to make changes at any time in order to improve design and to supply the best product possible.
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Typical Performance Curves

OP298 – Relative Radiant Intensity vs. Angular Displacement

OP293 – Relative Radiant Intensity vs. Angular Displacement

Percent Change in Apertured Power Output vs. Distance

Thermal Parameters

<table>
<thead>
<tr>
<th>Type Units</th>
<th>$R_{ThJA} ,(^oC/W)$</th>
<th>$\zeta_{Th}$</th>
<th>$\tau_{Th}$</th>
<th>K</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air</td>
<td>700</td>
<td>500</td>
<td>250</td>
<td>4.0</td>
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</tbody>
</table>

Notes:
1. Heat transfer minimized by holding unit in still air with minimum heat transferred through leads by conduction.
2. Unit mounted in double sided printed circuit board 0.250 inches (6.35 mm) below plastic. The land area is 0.080 inches square. This simulates normal use.
3. Unit immersed in circulating silicone fluid holding $T_{CASE} \leq 25^oC$. This simulates an infinite heat sink.

Refer to Application Bulletin 200 for use of these constants.