

## Product Specification

### 2.5Gbps 850nm PIN + Preamp, LC ROSA

#### HFD3180-108

#### PRODUCT FEATURES

- LC ROSA
- High performance GaAs PIN photodiode with separate transimpedance amplifier
- Low electrical parasitic
- TO46 package
- Data rates from 155Mbps to 2.5Gbps
- Low bias currents and voltages



The HFD3180-108 use a high-performance GaAs PIN photo-detector packaged with a transimpedance amplifier designed to meet performance requirements for data rates up to 2.5Gbps data communication over multi-mode optical fiber at 850nm. Applications include Ethernet, Fiber Channel and ATM protocols. The optical assembly is designed to interface either 50mm or 62.5mm multi-mode fiber.

The HFD3180-108 is designed to be paired with Advanced Optical Components VCSEL TOSA products (see data sheets for HFE419x products).

#### PRODUCT SELECTION

| Part Number | Description                                     |
|-------------|---|
| HFD3180-108 | 4 pin LC ROSA, rated for 1G and 2G applications |

## I. Absolute Maximum Ratings

| Parameter                  | Rating                      |
|----------------------------|-----------------------------|
| Storage Temperature        | -40 to +85°C                |
| Case Operating Temperature | -40* to +85°C               |
| Lead Solder Temperature    | 260°C, 10 sec.              |
| Power Supply Voltage       | -0.5V to 4V                 |
| Incident Optical Power     | +3 dBm average, +6 dBm peak |

### **Notice**

Stresses greater than those listed under “Absolute Maximum Ratings” may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operations section for extended periods of time may affect reliability.

### **Notice**

The inherent design of this component causes it to be sensitive to electrostatic discharge (ESD). To prevent ESD-induced damage and/or degradation to equipment, take normal ESD precautions when handling this product

## II. Electro-Optical Characteristics

3.0V < V<sub>cc</sub> < 3.6V, AC coupled to 50Ω (100Ω differential), -40°C < T < 85°C unless otherwise specified

| Parameters                                  | Test Condition  | Symbol                         | Min. | Typ. | Max. | Units   | Notes |
|---|---|--------------------------------|------|------|------|---------|-------|
| Data Rate                                   |   | DR                             | 0.15 |      | 2.5  | Gbps    |       |
| Supply Voltage                              |   |                                | 3.0  | 3.3  | 3.6  | V       |       |
| Supply Current                              | P <sub>R</sub> = 0μW, R <sub>L</sub> = 50Ω AC coupled                           | I <sub>CC</sub>                |      | 25   | 35   | mA      | 1     |
| Optical Return Loss                         | P <sub>R</sub> = -12dBm   | ORL                            | 12   |      |      | dB      | 1     |
| Input Optical Wavelength                    | 0°C to 70°C   | λ <sub>p</sub>                 | 770  | 850  | 870  | nm      |       |
| Maximum Average Input Power before Overload |   | P <sub>MAX</sub>               | 0    | +3   |      | dBm     |       |
| Differential Output Voltage Swing           | P <sub>R,OMA</sub> = -12Bm, AC Coupled to R <sub>L</sub> = 50Ω                  | V <sub>o(pk-pk)</sub>          | 100  | 150  | 220  | mV      | 1,2   |
| Differential Transimpedance                 | P <sub>R,OMA</sub> = -12dBm, AC Coupled to R <sub>L</sub> = 50Ω                 | T                              | 1500 | 2500 | 3500 | V/W     | 1,2   |
| -3dB Optical/Electrical Bandwidth           | P <sub>R,OMA</sub> = -12dBm   | BW                             | 1.4  | 2    |      | GHz     | 1,2,3 |
| Low Frequency -3dB Cutoff                   | P <sub>R,OMA</sub> = -12dBm   | BW <sub>LF</sub>               |      |      | 10   | KHz     | 1,2,3 |
| Output Impedance                            |   | Z <sub>OUT</sub>               | 42   | 50   | 58   | Ω       |       |
| Output Return Loss                          | F < 2GHz  | S <sub>22</sub>                | 8    | 12   |      | dB      |       |
| RMS Input Referred Noise Equivalent Power   | 1.875GHz, 4-pole BT Filter, P <sub>R</sub> = 0uW (Dark), BER 10 <sup>-12</sup>  | NEP                            |      |      | 20   | μW, OMA | 4     |
| Sensitivity, OMA                            | DR ≤ 2.5Gbps  | S                              |      | -20  | -18  | dBm     | 5     |
| Stressed Sensitivity, OMA                   | DR ≤ 2.5Gbps  | S <sub>Stressed</sub>          |      | -17  | -14  | dBm     | 5,6   |
| Rise/Fall Time                              | P <sub>R,OMA</sub> = -12dBm, (20%-80%)  | T <sub>R</sub> /T <sub>F</sub> |      | 120  | 150  | ps      | 2,7   |
| Pulse Width Distortion                      |   | PWD                            |      |      | 5    | %       |       |
| Power Supply Rejection Ratio                | P <sub>R</sub> = 0μW (Dark), 5MHz < F < 2GHz                                    | PSRR                           | 20   |      |      | dB      | 1,8   |
| Group Delay                                 | P <sub>R,OMA</sub> = -12dBm, AC Coupled to R <sub>L</sub> = 50Ω 2MHz < F < 2GHz | Delay                          | -50  |      | 50   | ps      | 9     |
| Deterministic Jitter                        | P <sub>R,OMA</sub> = -12dBm, AC Coupled to R <sub>L</sub> = 50Ω                 | DJ <sub>TIA</sub>              |      | 30   | 40   | ps      | 10    |
| Random Jitter                               | P <sub>R,OMA</sub> = -12dBm, AC Coupled to R <sub>L</sub> = 50Ω                 | RJ <sub>TIA</sub>              |      | 3    | 5    | ps      | 11    |

### Notes:

1. P<sub>R</sub> is the average optical power at the fiber face.
2. P<sub>R,OMA</sub> is the peak to peak optical power at the fiber face (Optical Modulation Amplitude)
 
$$P_{R,OMA} \equiv \frac{2P_R(ER-1)}{ER+1}$$
 where ER is the extinction ratio (linear) of the optical source.
3. Bandwidth and Low Frequency Cutoff are measured with a small signal sinusoidal light source with -12dBm average power
4. RMS input referred optical noise equivalent power is obtained by measuring the RMS output noise into a 3200 MHz, 4-pole Bessel-Thompson filter then dividing by the responsivity. A scaling factor of 14 is used to predict a BER of 10<sup>-12</sup>.
5. Sensitivity is measured with an optical source with an extinction ratio of 3dB.

6. Stressed receiver sensitivity is measured with 3.5dB vertical eye closure (intersymbol interference) and with 0.3UI of jitter added. The measurement technique is defined in IEEE 802.3ae.

7. Rise/Fall times are corrected for optical source Rise/Fall times.

$$T_{TIA}^2 = T_{MEASURED}^2 - T_{OPTICAL}^2$$

8. Value shown is with no external power supply filtering.

9. Group delay is a sensitive measurement to package interface, and includes the effects of PD, TIA and package. Measurement is made with TO leads as short as possible.

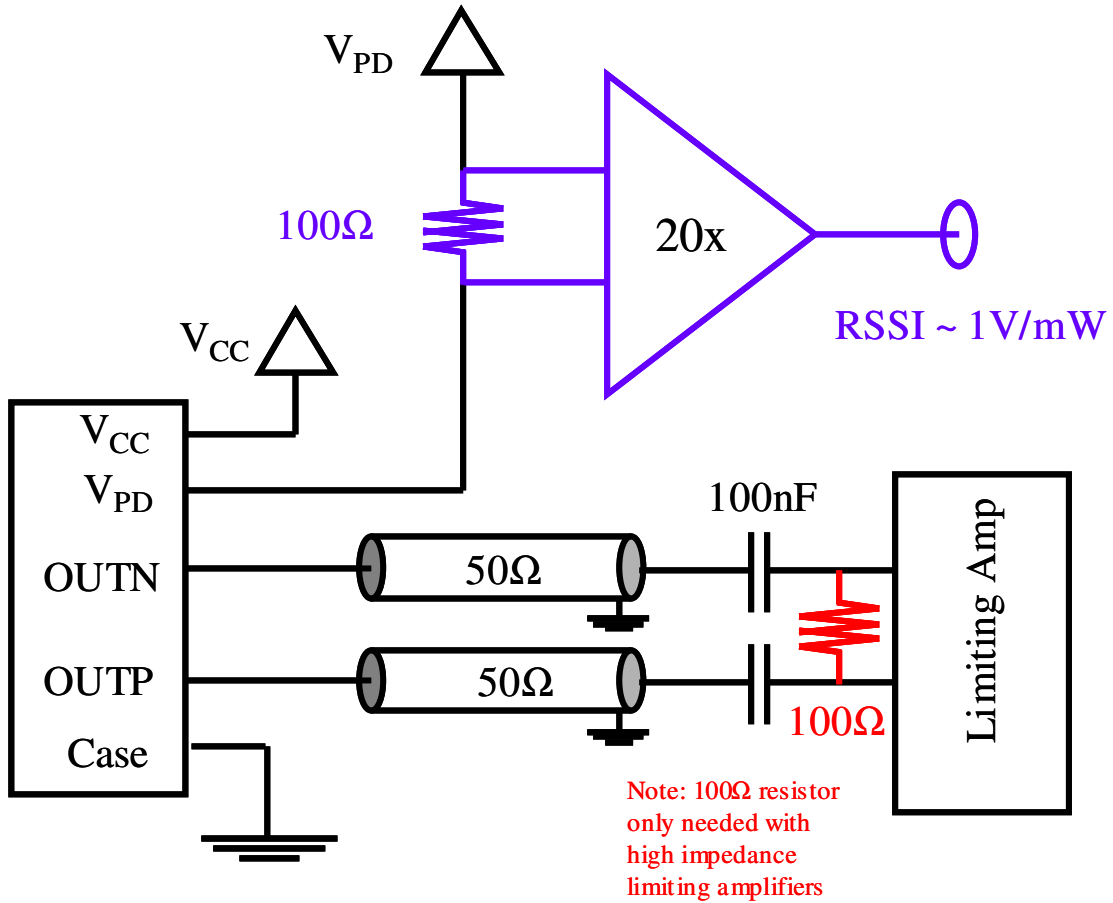
10.  $DJ_{TIA}$  is specified as contributed DJ by the TIA, obtained from

$$DJ_{TIA}^2 = DJ_{TOTAL}^2 - DJ_{OPTICAL}^2$$

11.  $RJ_{TIA}$  is specified as contributed DJ by the TIA, obtained from

$$RJ_{TIA}^2 = RJ_{TOTAL}^2 - RJ_{OPTICAL}^2$$

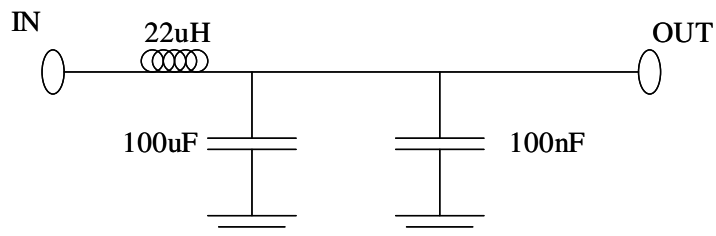
**III. Interface configuration**



**Optional RSSI implementation is shown in blue, implemented on HFD3180-103 only**  
**Optional 100Ω differential termination for high impedance limiting amplifiers is shown in red.**

Recommended bias filter network

**Note, better performance will be obtained if a ferrite bead is used in place of the inductor.**



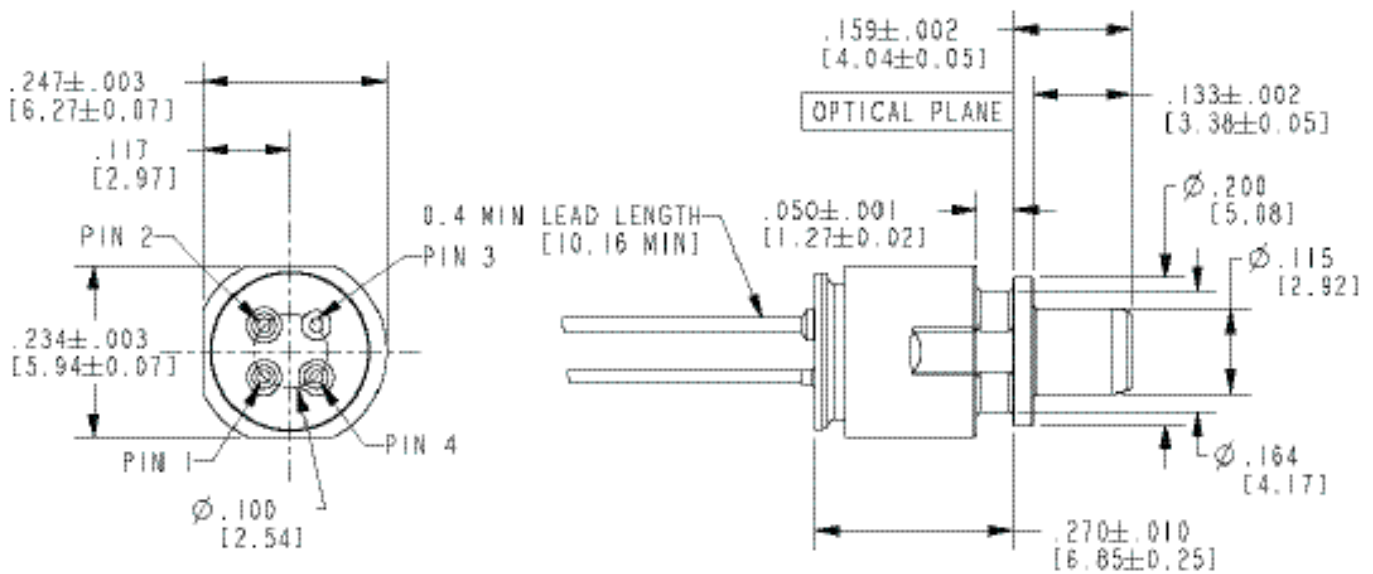
**IV. Environmental Specifications**

| Parameter                  | Symbol           | Min | Typ | Max | Units | Ref. |
|----------------------------|------------------|-----|-----|-----|-------|------|
| Case Operating Temperature | T <sub>op</sub>  | -40 |     | 85  | °C    |      |
| Storage Temperature        | T <sub>sto</sub> | -40 |     | 85  | °C    |      |

**V. Mechanical Specifications**

| PIN | Description |
|-----|-------------|
| 1   | Vcc         |
| 2   | OUTN        |
| 3   | GND (Case)  |
| 4   | OUTP        |

(dimensions are in inches (mm))



**VI. Revision History**

| <b>Revision</b> | <b>Date</b> | <b>Description</b>  |
|-----------------|-------------|---|
| B00             | 10/6/2014   | <ul style="list-style-type: none"><li>• Changed to Finisar Format</li></ul> |

**VII. For More Information**

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