



**THE DATASHEET OF  
HFD3081-108-XBA**



## Product Specification

### SW Detector 2Gbps, PIN+Pre-amp, TO-46

#### HFD3081-108

#### PRODUCT FEATURES

- Low electrical parasitic TO-46 package
- 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 HFD3081-108 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

#### PRODUCT SELECTION

| Part Number | Description   |
|-------------|---|
| HFD3081-108 | Detector, 4 pin TO-46, 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 |
| ESD Exposure (Human Body Model) | 225V <sup>1</sup>           |

### **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                            | ICC                            |                    | 25              | 35                   | mA      | 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 Responsivity                   | P <sub>R,OMA</sub> = -12dBm, AC Coupled to R <sub>L</sub> = 50Ω                  | T                              | 1500               | 2700            | 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> = 0μW (Dark), BER 10 <sup>-12</sup>   | NEP                            |                    |                 | 20                   | μW, OMA | 4     |
| Sensitivity, OMA                            | DR ≤ 2.5Gbps   | S                              |                    | -20.5           | -18.5                | dBm     | 5     |
| Stressed Sensitivity, OMA                   | DR ≤ 2.5Gbps   | S <sub>Stressed</sub>          |                    | -17.5           | -14.5                | 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   |
| PD Bias Voltage                             |  | PD <sub>BIAS</sub>             | V <sub>cc</sub> -1 | V <sub>cc</sub> | V <sub>cc</sub> +0.5 | V       |       |
| 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    |

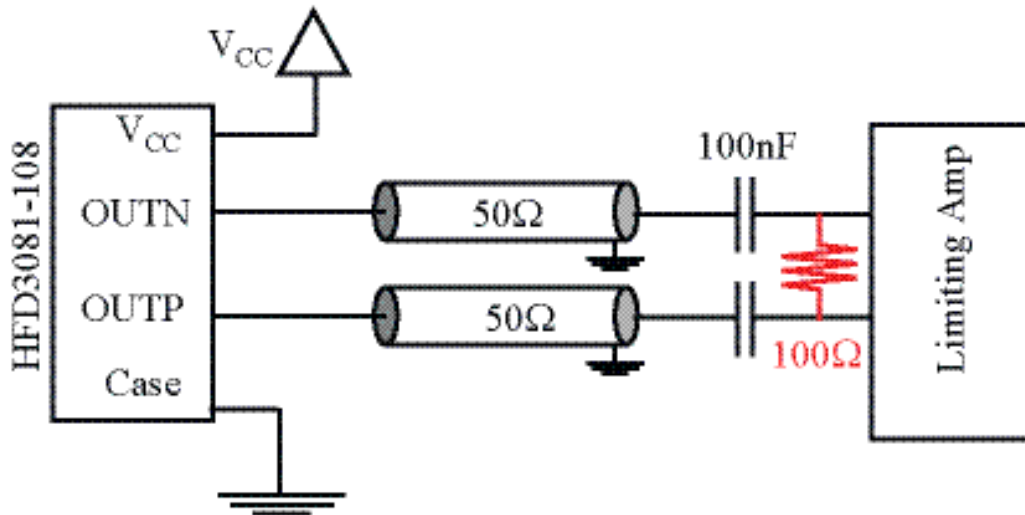
### Notes:

- P<sub>R</sub> is the average optical power at the fiber face. No loss in external optical system is assumed; any actual power loss in external optics should be considered in the system design.
- P<sub>R,OMA</sub> is the peak to peak optical power at the fiber face (Optical Modulation Amplitude)  

$$P_{R,OMA} = \frac{2P_R(ER-1)}{ER+1}$$
 where ER is the extinction ratio (linear) of the optical source.
- Bandwidth and Low Frequency Cutoff are measured with a small signal sinusoidal light source with -12dBm average power
- RMS input referred optical noise equivalent power is obtained by measuring the RMS output noise into a 1875 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>.
- Sensitivity is measured with an optical source with an extinction ratio of 3dB.
- 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.
- 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 CONNECTION

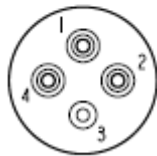
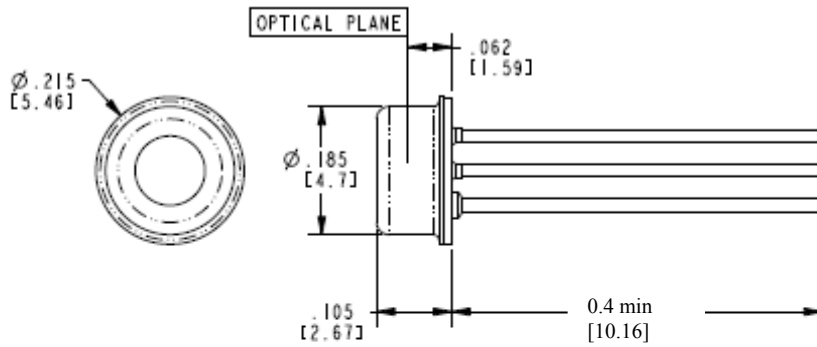


**Optional 100Ω differential termination for high impedance limiting amplifiers is shown in red.**

**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    |      |

**IX. Mechanical Specifications**



LEAD-END VIEW

| PIN # | FUNCTION          |
|-------|-------------------|
| 1     | V <sub>CC</sub>   |
| 2     | V <sub>OUT-</sub> |
| 3     | GND (CASE)        |
| 4     | V <sub>OUT+</sub> |

**XI. Revision History**



| <b>Revision</b> | <b>Date</b> | <b>Description</b>  |
|-----------------|-------------|---------------------|
| A1              | 4/26/2013   | • Document created. |

**XII. For More Information**

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