



## Features

- High Data Rate Capability: 2.5 Gbit/s
- APD or PIN Photodetector
- Fully Operational Through the 1.3  $\mu\text{m}$  to 1.55  $\mu\text{m}$  Wavelength Range
- Typical Sensitivity -34 dBm (APD), -25 dBm (pin)
- >25 dB Typical Dynamic Range
- High-Performance GaAs Preamplifier
- Compact, Butterfly Package
- Single-Ended or Differential Outputs

## Applications

- Line Terminal Equipment
- High-Speed Networks up to 2.5 Gbit/s
- SONET OC-48 and SDH STM-16 Telecom App
- Extended Reach Datacom and Telecom App
- Digital Video



The FORX Linear Photoreceiver is designed for high-speed and high sensitivity analog and digital applications, featuring a surface-coupled coplanar waveguide APD photodiode and a linear transimpedance amplifier within a hermetically sealed package. Its high conversion gain and low input-referred noise ensure exceptional linearity and precision.

For added convenience, Agiltron offers a driving PCB for easy integration and a metal box protective package to safeguard against ESD in laboratory environments, both come with a specially designed low noise power supply.

Avalanche photodiodes (APDs) offer a better signal-to-noise ratio (SNR) than PIN photodiodes, primarily in low-light or low-signal conditions. Specifically, the SNR advantage of APDs is most significant when:

1. In low-light conditions, APDs provide internal gain (multiplication of photocurrent), boosting weak signals before noise from downstream electronics becomes significant. This leads to improved SNR compared to PIN diodes, which lack internal gain and are limited by amplifier noise at low signal levels.
2. APDs typically have higher capacitance and lower bandwidth than PINs for the same area. When the application doesn't require ultra-high-speed operation, APDs can be beneficial due to the improved SNR from gain.
3. APDs multiply the signal but also introduce excess noise due to the stochastic multiplication process. However, when the dominant noise source is thermal (like preamp noise in a PIN system), the APD's gain outweighs the multiplication noise.

Due to their high sensitivity to electrostatic discharge, warranty coverage applies only to fully metal covered modules the benchtops, which include proper protection. Other versions of the lasers and photodetectors are not covered by any warranty. Please use them with great caution.

## Specifications

| Parameter                                                        |                                | Min   | Typical | Max   | Unit              |
|------------------------------------------------------------------|--------------------------------|-------|---------|-------|-------------------|
| Negative Supply Voltage                                          |                                | 0     |         | -6.0  | V                 |
| Optical Input Power                                              |                                |       |         | 3     | dBm               |
| Operating Case Temperature                                       |                                | -20   |         | 65    | °C                |
| Storage Temperature                                              |                                | -40   |         | 85    | °C                |
| Lead Soldering Temperature                                       |                                |       |         | 250   | °C                |
| Lead Soldering Time                                              |                                |       |         | 10    | s                 |
| Power Supply Voltages:                                           | Negative Supply                | -5.46 | -5.2    | -4.94 | V                 |
|                                                                  | APD Bias Supply <sup>[2]</sup> | 35    |         | 85    |                   |
| Power Supply Currents:                                           | Negative Supply                |       | 120     | 160   | mA                |
|                                                                  | APD Bias                       |       |         | 4     |                   |
| Power Dissipation                                                |                                |       | 0.6     |       | W                 |
| Small Signal (<10 $\mu\text{A}$ ) Transimpedance <sup>[4]</sup>  |                                | 5     | 10      |       | k $\Omega$        |
| Large Signal (>100 $\mu\text{A}$ ) Transimpedance <sup>[4]</sup> |                                |       | 0.5     | 0.7   | k $\Omega$        |
| Input Noise Current (100 kHz—2.5 GHz)                            |                                |       | 250     | 300   | nA <sub>RMS</sub> |
| Output Return Loss                                               |                                | 10    | 15      |       | dB                |
| Wavelength Range                                                 |                                | 1.25  |         | 1.6   | $\mu\text{m}$     |
| Sensitivity <sup>[4]</sup>                                       | Gain = 12                      |       | -34     | -32   | dBm               |
| Maximum Optical Input Power <sup>[4]</sup>                       | Gain = 3                       | -3    |         |       | dBm               |
| High-frequency Cutoff at -3 dB from Midband Response             |                                | 1.4   | 1.7     | 2.3   | GHz               |
| Maximum Reflectance                                              |                                |       |         | -27   | dBm               |

### Notes:

[2]. The gain = 12 APD voltage at 25 °C is supplied with each device. For optimum performance, VAPD must be set within 50 mV of the specified value. VAPD needs to be temperature compensated to maintain constant gain over operating temperature. The nominal compensation is 0.18%/°C.

[3]. Transimpedance,  $TZ = \frac{V_{D-P}}{I_{PH(Avg)}}$ , where  $I_{PH(Avg)}$  is the average photodiode current.

[4]. 2.5 Gb/s, 2<sup>23</sup> -1 PRBS, 3 x 10<sup>-11</sup> BER

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Rev 11/28/25

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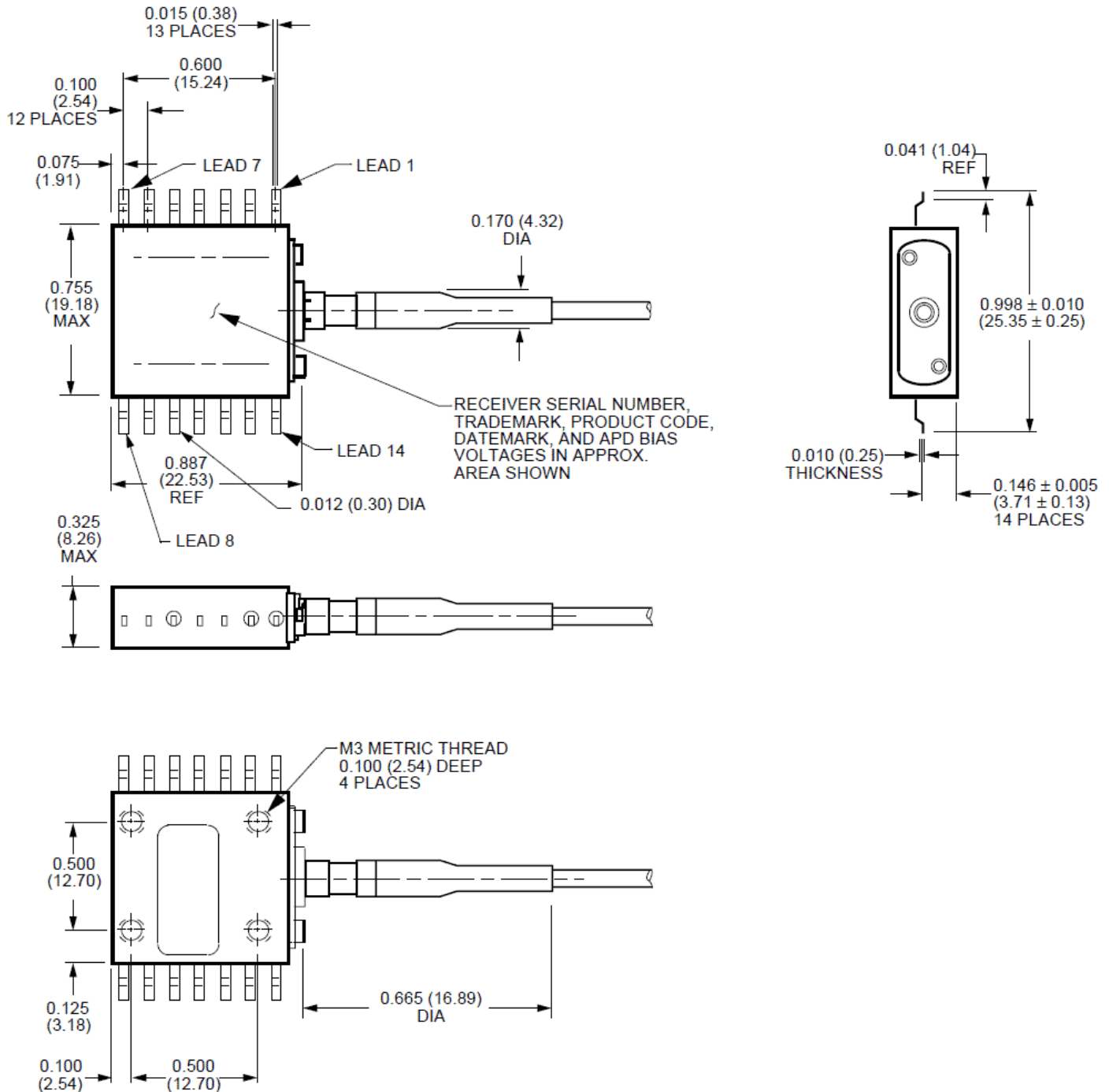
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## DATASHEET

### Dimensions (mm)



\*Product dimensions may change without notice. This is sometimes required for non-standard specifications.

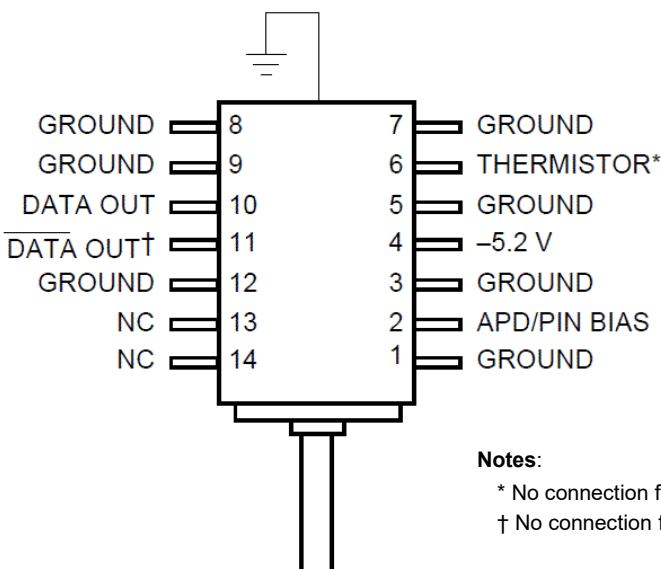
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### Pin Definition



#### Notes:

- \* No connection for PIN versions (not connected internally).
- † No connection for single-ended versions.

| Pin # | Symbol       | Function        | Pin # | Symbol    | Function      |
|-------|--------------|-----------------|-------|-----------|---------------|
| 1     | GND          | Ground          | 8     | GND       | Ground        |
| 2     | APD/PIN BIAS | Photodiode bias | 9     | GND       | Ground        |
| 3     | GND          | Ground          | 10    | DATA OUT  | DATA          |
| 4     | Vee          | Vee (-5.2 V)    | 11    | DATA OUT† | DATA†         |
| 5     | GND          | Ground          | 12    | GND       | Ground        |
| 6     | Thermistor   | Thermistor *    | 13    | NC        | No connection |
| 7     | GND          | Ground          | 14    | NC        | No connection |
|       |              |                 | CASE  | GND       | Ground        |

#### Notes:

- \* The thermistor is not available in the PIN version of the receiver. In 1319P-Type receivers, this pin will be open circuit internally.
- † This is an internal open circuit in single-ended output Receivers.

### Application Notes

#### Mounting and Connections

The pigtail consists of a 41 in.  $\pm$  13 in. (1041 mm  $\pm$  330 mm), 8  $\mu$ m core, single-mode fiber. The receive pigtails have a 1600  $\mu$ m OD jacket diameter. Both models of the receiver are available with FC/PC or SC optical connectors. Other connector options may be available. Contact your Agiltron Sales Office for availability and ordering information (Part Number).

The fiber bending radius during operation and storage is 1.5 in. (38 mm) minimum.

#### Electrostatic Discharge

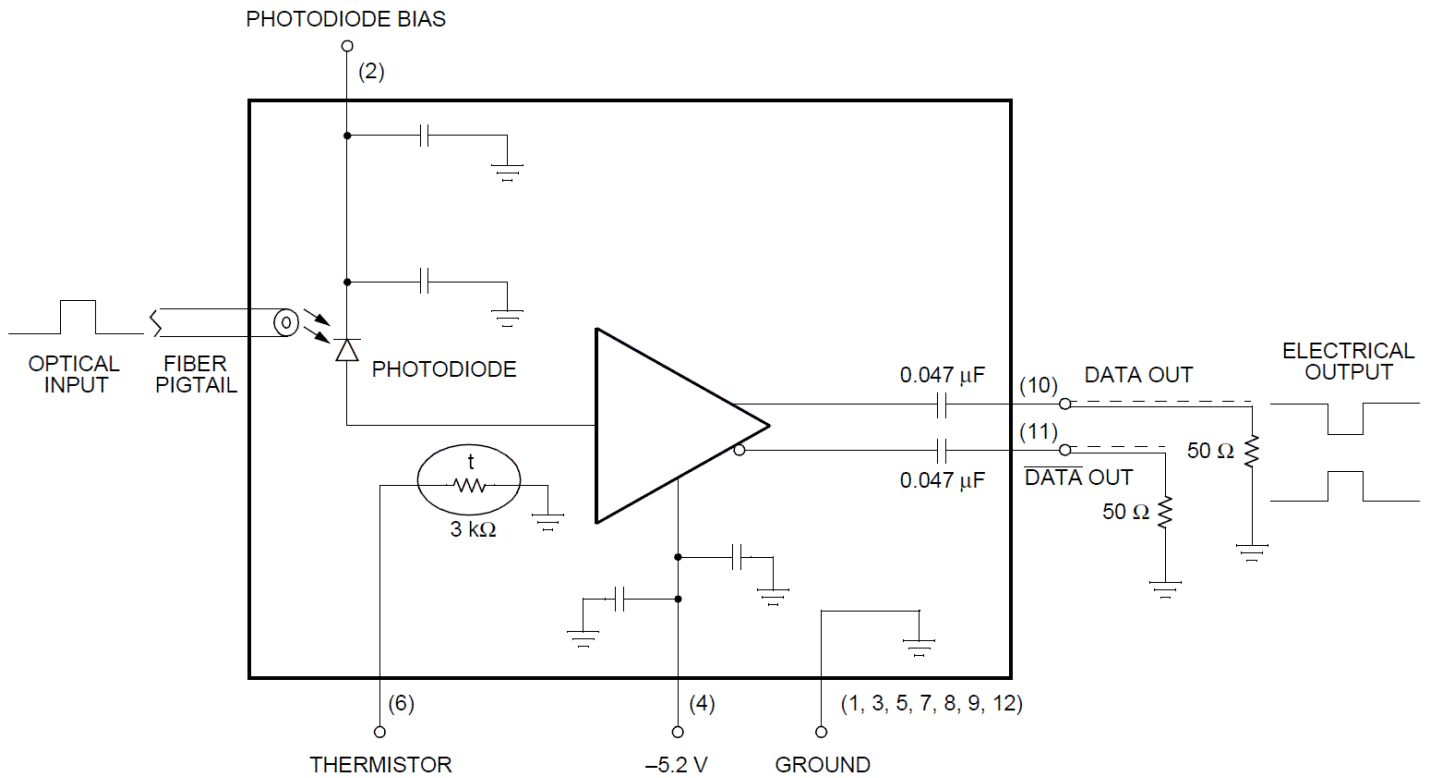
**CAUTION:** Electrostatic discharge (ESD) will cause permanent damage to the product. Please avoid any ESD to the input pins or output connector. Use standard ESD protective equipment when handling this product.

Although protection circuitry is designed into the device, take proper precautions to avoid exposure to ESD.

Lucent employs a human-body model (HBM) for ESD- susceptibility testing and protection design evaluation. ESD voltage thresholds are dependent on the critical parameters used to define the model. A standard HBM (resistance = 1.5 k $\Omega$ , capacitance = 100 pF) is widely used and, therefore, can be used for comparison purposes.

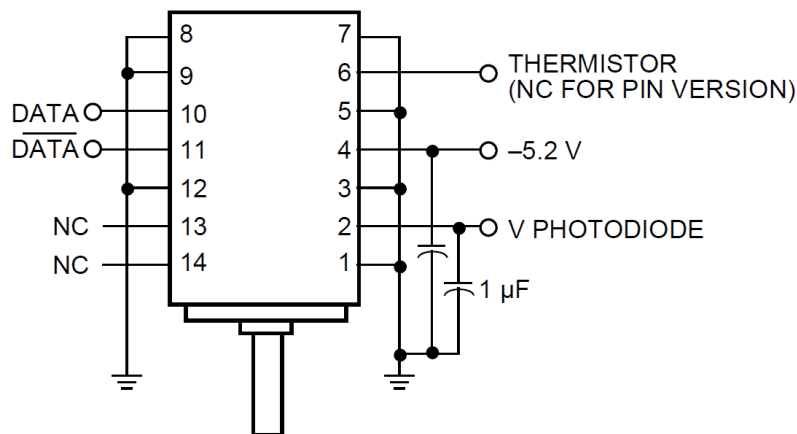
The HBM ESD withstand voltage established for the 1319-Type receiver is  $\pm$ 500 V.

### High-Speed Lightwave Receiver Schematic



**Note:** The thermistor is not present on PIN version.

### Recommended Circuit Diagram



**Note:** Pin 11 is a NC for single-ended output versions.

## Ordering Information (Part Number)

|              | 2                  | <input type="checkbox"/> | 02        | 1       | <input type="checkbox"/> | 11            | <input type="checkbox"/>               |
|--------------|--------------------|--------------------------|-----------|---------|--------------------------|---------------|----------------------------------------|
| Prefix       | Detector Type      | Wavelength Range         | Bandwidth | Module* |                          | Configuration | Connector <sup>[1]</sup>               |
| <b>FORX-</b> | PIN = 1<br>APD = 2 | 1200-1600nm = 1          | 2GHz = 02 |         | Non = 1<br>Yes = 2       | Standard = 11 | FC/PC = 2<br>FC/APC = 3<br>Special = 0 |

\* Module contains driver and power supply.

[1]. The default connector configuration uses fiber with 0.9 mm buffer protection. The connector cannot be installed directly onto bare fiber because the bare fiber is prone to damage during shipping. However, the connector can be assembled on bare fiber if a 3 cm protective loose tube is added for reinforcement. The customer may remove this protective tube after testing. The optical power handling of a standard connector is less than 0.5 W for SMF-28 fiber and decreases further for smaller-core fibers.

### Laser Safety

This product meets the appropriate standard in Title 21 of the Code of Federal Regulations (CFR). FDA/CDRH Class 1M laser product. This device has been classified with the FDA/CDRH under accession number 0220191. All versions of this laser are Class 1M laser products, tested according to IEC 60825-1:2007 / EN 60825-1:2007. An additional warning for Class 1M laser products. For diverging beams, this warning shall state that viewing the laser output with certain optical instruments (for example eye loupes, magnifiers, and microscopes) within a distance of 100 mm may pose an eye hazard. For collimated beams, this warning shall state that viewing the laser output with certain instruments designed for use at a distance (for example telescopes and binoculars) may pose an eye hazard.

Wavelength = 1.3/1.5  $\mu\text{m}$ .

Maximum power = 30 mW.

