P172-Type Receiver

The P172-Type PIN/Preamp and APD/Preamp receivers are available in a mini-DIL package (top) or a gull-wing package (bottom).

Features

- Low-profile, 8-lead mini-DIL or gull-wing style package:
  — Suitable for SONET/SDH applications
- Metal package:
  — Offers superior shielding for high noise immunity
- Planar structure for high reliability
- Operating wavelength range:
  — 1.25 μm—1.6 μm
- Available in 8 μm core single-mode fiber or 62.5 μm core multimode fiber pigtails
- Wide operating temperature range:
  — APD/PIN, –40 °C to +85 °C
- Scheduled to be qualified according to *Telcordia Technologies*™ GR-468-CORE
- Typical sensitivity:
  — APD, –33 dBm
  — PIN, –24 dBm
- Thermistor in APD version

Applications

- Long-reach or metro SONET OC-48 and SDH STM-16, or multidata-rate telecommunications applications
- SONET/SDH receivers and transponders
- Line terminal equipment

Benefits

- Compact size
- Easily board mounted

Description

The P172-type receiver consists of a PIN or APD coupled to a single-mode or multimode fiber pigtail and a linear preamplifier. Both the PIN and APD are rear-illuminated planar diode structures with a low-capacitance active area for maximum responsivity and speed.

This device incorporates the new Laser 2000 manufacturing process from the Optoelectronics Products unit of Agere Systems Inc. Laser 2000 is a low-cost platform that targets high-volume manufacturing and tight product distributions on all optical subassemblies. This platform incorporates an advanced optical design that is produced on Agere Systems' highly automated production lines. The Laser 2000 platform is qualified for central office and uncontrolled environments, and can be used for applications requiring high performance and low cost.

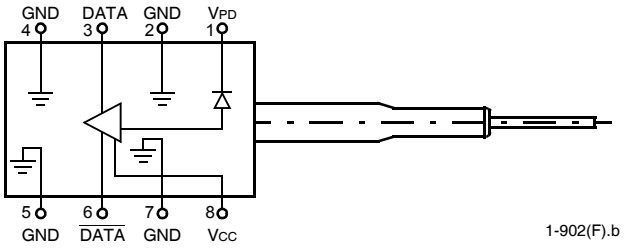


Figure 1. P172P PIN/Preamp Schematic (Top View)

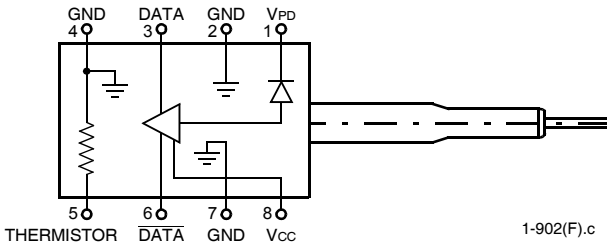


Figure 2. P172A APD/Preamp (Top View)

Table 1. P172-Type PIN/Preamp and APD/Preamp Pin Descriptions

Pin Number	Description
1	Photodiode Bias
2	Case Ground
3	DATA*
4	Case Ground
5	Thermistor/Case Ground†
6	$\overline{\text{DATA}}$‡
7	Case Ground
8	V_{CC}

* Logic high when light is on.
† Thermistor in APD version; case ground in PIN version
‡ Logic low when light is on.

Absolute Maximum Ratings

Stresses in excess of the absolute maximum ratings can cause permanent damage to the device. These are absolute stress ratings only. Functional operation of the device is not implied at these or any other conditions in excess of those given in the operational sections of the data sheet. Exposure to absolute maximum ratings for extended periods can adversely affect device reliability.

Parameter	Symbol	Min	Max	Unit
Positive Supply Voltage	V_{CC}	–0.5	4.0	V
Optical Input Power: APD PIN	 P_{IN} P_{IN}	 — —	 0 8.0	 dBm dBm
Operating Case Temperature Range: APD/PIN	 T_C	 –40	 85	 °C
Storage Temperature Range	T_{stg}	–40	85	°C
Lead Soldering Temperature	—	—	250	°C
Lead Soldering Time	—	—	10	s

Electrical Characteristics

Minimum and maximum values specified over operating case temperature range and end of life (EOL), and typical values are for 25 °C and beginning of life (BOL), unless otherwise specified

Table 2. Electrical Characteristic

Parameter	Symbol	Min	Typ	Max	Unit
dc Power Supply Voltages:					
Positive Supply	V_{CC}	3.15	3.3	3.45	V
APD Operating Bias Voltage	V_{OP}	45	—	70	V
APD Operating Voltage Temperature Coefficient	—	0.07	—	0.14	V/°C
PIN Operating Bias Voltage	V_{OP}	3.0	5.0	15	V
dc Power Supply Currents:					
Positive Supply	I_{CC}	—	55	101	mA
APD Bias Supply at V_{OP}	I_{APD}	—	—	4	mA
PIN Bias Supply at V_{OP}	I_{PIN}	—	—	4	mA
dc Power Dissipation	P_{DISS}	—	200	350	mW
Small Signal (<10 μA) Transimpedance	T_z	1.7	2.5	3.1	kΩ
Input Noise Current (100 kHz—2 GHz)	N_{rms}	—	322	466	nArms
Output Return Loss (130 MHz—5 GHz)	S_{22}	—	–15	–9	dB
3 dB Bandwidth	f_C	1.7	2.0	—	GHz
Thermistor resistance at 25 °C*	R_{TH}	9.5	10	10.5	kΩ

* The resistance of the thermistor is inversely proportional to the temperature. The temperature can be calculated from the resistance value using the Steinhart-Hart equation: $1/T = A + B \ln(R) + C \ln(R)^3$; where A, B, and C are constants: $A = 1.0267 \times 10^{-3}$, $B = 2.565 \times 10^{-4}$, $C = -4.5421 \times 10^{-8}$.

Optical Characteristics

Minimum and maximum values specified over operating case temperature range and end of life (EOL), and typical values are for 25 °C and beginning of life (BOL), unless otherwise specified.

Table 3. Optical Characteristics

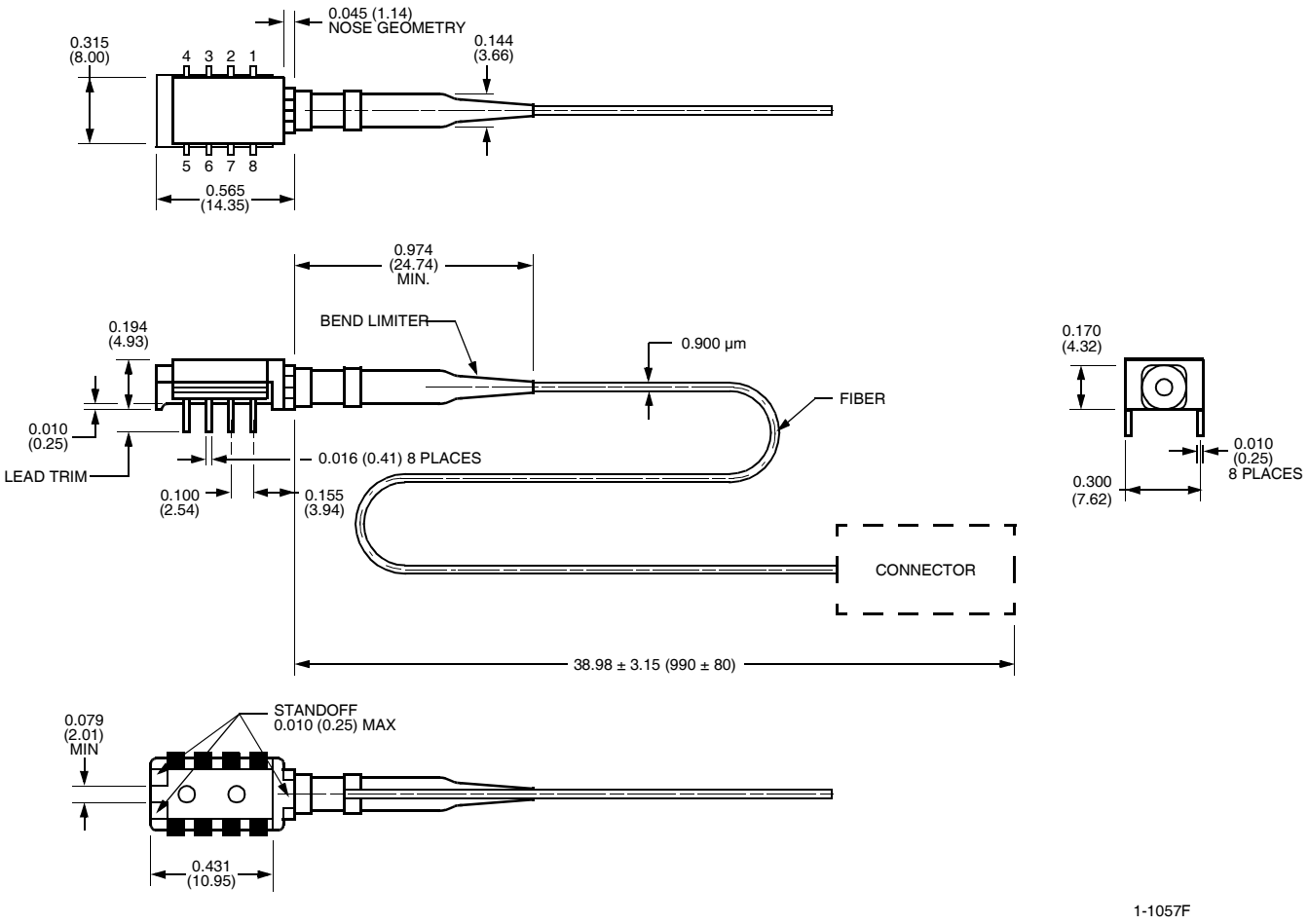
Parameter	Symbol	Min	Typ	Max	Unit
Optical Wavelength for Rated Sensitivity	λ	1.25	—	1.6	μm
Responsivity (at 1310 nm, $V_{BIAS} = V_{OP}$):	R				
APD at –30 dBm, 25 °C		9.0	—	—	A/W
APD at –30 dBm, –40 °C to +85 °C		8.6	—	—	A/W
PIN at –20 dBm, 25 °C		0.81	—	—	A/W
PIN at –20 dBm, –40 °C to +85 °C		0.70	—	—	A/W
Sensitivity (2.5 Gbits/s, $2^{23} – 1$ PRBS, 1 x 10^{-10} BER, 1310 nm, $V_{BIAS} = V_{OP}$)*:	P_{RMIN}				
APD Version:					
At 25 °C		—	–33	–32	dBm
At –40 °C to +85 °C		—	–32	–31	dBm
PIN Version:					
At 25 °C		—	–24	–23	dBm
At –40 °C to +85 °C		—	–23	–22	dBm
Overload (2.5 Gbits/s, $2^{23} – 1$ PRBS, 1 x 10^{-10} BER, 1550 nm, $V_{BIAS} = V_{OP}$):	P_{RMAX}				
APD Version		–6	–3	—	dBm
PIN Version		0	1	—	dBm
Optical Return Loss:					
Single-mode Fiber	—	—	—	–27	dB
Multimode Fiber	—	—	—	–14	dB

* Sensitivity specifications are measured at transmitter beginning-of-life condition (12 dB extinction ratio). At transmitter end-of-life conditon (8.2 dB extinction ratio), 1 dB sensitivity degradation from BOL condition is expected.

Outline Diagrams

P172-Type Through-Hole Package

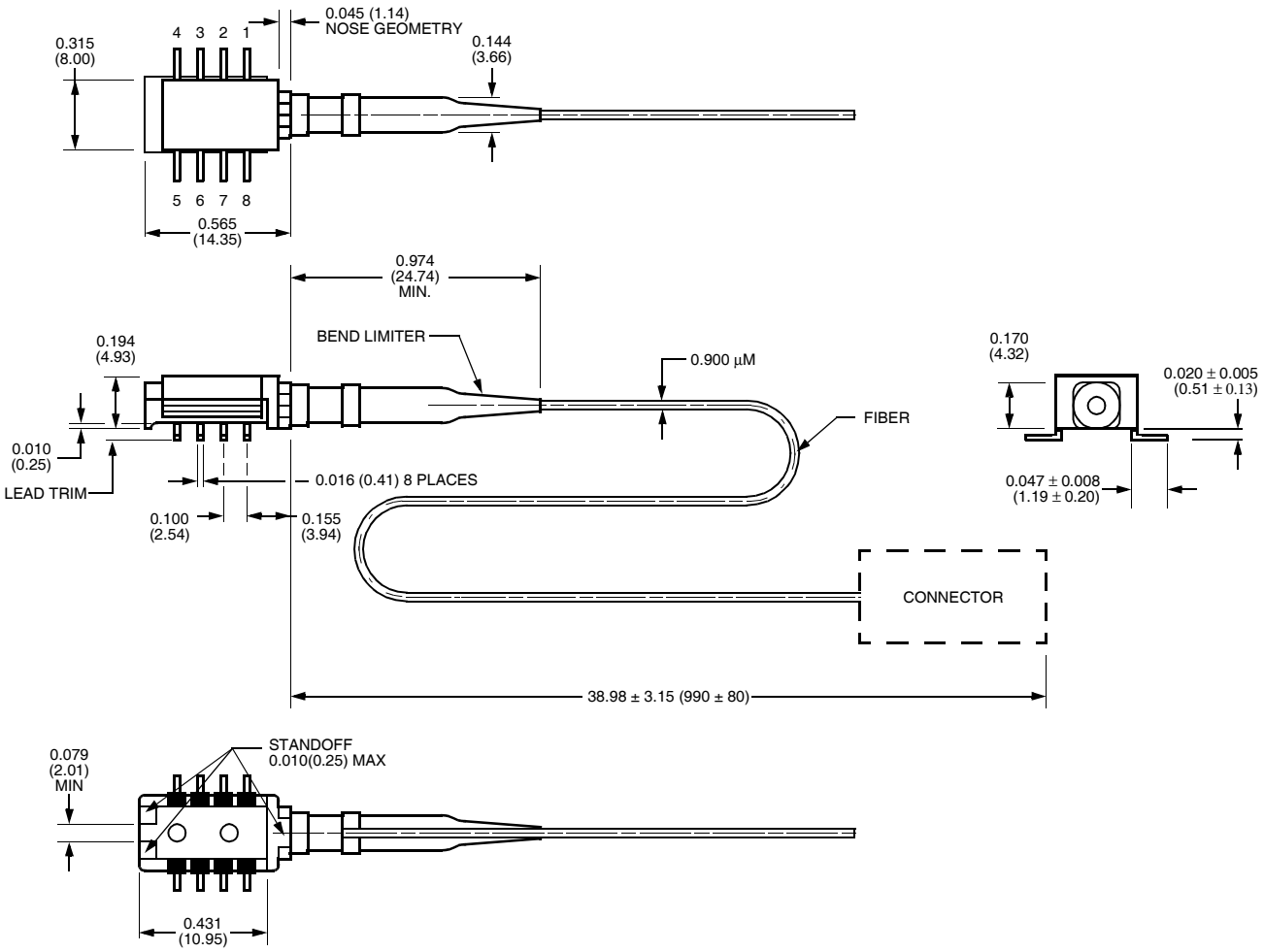
Dimensions are in inches and (millimeters).



Outline Diagrams (continued)

P172-Type Gull-Wing Package

Dimensions are in inches and (millimeters).



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Qualification Information

The P172-type receiver is scheduled to complete the following qualification tests and meet the intent of *Telcordia Technologies* GR-468-CORE.

Table 4. P172Type Qualification Information

Test	Reference	Conditions	Sample Size	Pass/Fail Criteria
Mechanical Shock and Vibration	*Telcordia Technologies* GR-468-CORE, Section 8.3.2	500 g, 0.5 ms Condition A, 20 g, 20 Hz to 2000 Hz, 4 min./cycle, 4 cycles	11	10% Responsivity Change After Completion of Both Tests
Thermal Shock	MIL-STD-883 Method 1011	0°C to 100 °C, 20 cycles	11	Physical Attributes and Leak Check
Lead Integrity	MIL-STD-883 Method 2004	Condition A	To Be Provided by the Supplier	—
Solderability	MIL-STD-883 Method 2003	—	To Be Provided by the Supplier	—
Low Temperature Storage	—	–40 °C storage 2000 hours	11	10% Responsivity Change After Completion of Test
High Temperature Storage	—	85°C storage 2000 hours	11	10% Responsivity Change After Completion of Test
Temperature Cycling	*Telcordia Technologies* GR-468-CORE, Section 5.20	–40 °C to +85 °C, 500 cycles	11	10% Responsivity Change After Completion of Test
Damp Heat	MIL-STD-883 Method 103	85 °C/85% RH 1000 hours	11	10% Responsivity Change After Completion of Test
Cyclic Moisture Resistance	*Telcordia Technologies* GR-468-CORE, Section 5.23	—	11	10% Responsivity Change After Completion of Test
ESD Threshold	*Telcordia Technologies* GR-468-CORE, Section 5.22	—	6	*Telcordia* Requirement
Internal Moisture	MIL-STD-883 Method 1018	—	11 Pieces After Thermal Shock Test	Max 5000 ppm Water Vapor After Other Test Cells

Ordering Information

Table 5. P172-Type Receiver Ordering Information

Product Code	Detector Type	Connector type	Lead type	Fiber type	Comcode
P172ABCA	APD	SC/PC	Through Hole	SMF	108566076
P172ABCF	APD	FC/PC	Through Hole	SMF	108566084
P172ABCS	APD	LC	Through Hole	SMF	108898040
P172ABCJ	APD	MU	Through Hole	SMF	109113209
P172ACCA	APD	SC/PC	Gull Wing	SMF	109122325
P172ACCF	APD	FC/PC	Gull Wing	SMF	109122333
P172ACCS	APD	LC	Gull Wing	SMF	109122341
P172ACCJ	APD	MU	Gull Wing	SMF	109122358
P172PBCA	PIN	SC/PC	Through Hole	SMF	108566100
P172PBCF	PIN	FC/PC	Through Hole	SMF	108566118
P172PBCS	PIN	LC	Through Hole	SMF	108898057
P172PBCJ	PIN	MU	Through Hole	SMF	109113308
P172PCCA	PIN	SC/PC	Gull Wing	SMF	109112366
P172PCCF	PIN	FC/PC	Gull Wing	SMF	109122374
P172PCCS	PIN	LC	Gull Wing	SMF	109122382
P172PCCJ	PIN	MU	Gull Wing	SMF	109122390
P172PBAA	PIN	SC/PC	Through Hole	MMF	109113266
P172PBAF	PIN	FC/PC	Through Hole	MMF	109113274
P172PBAS	PIN	LC	Through Hole	MMF	109113290
P172PBAJ	PIN	MU	Through Hole	MMF	109113282
P172PCAA	PIN	SC/PC	Gull Wing	MMF	109122283
P172PCAF	PIN	FC/PC	Gull Wing	MMF	109122291
P172PCAS	PIN	LC	Gull Wing	MMF	109122309
P172PCAJ	PIN	MU	Gull Wing	MMF	109122317

Table 6. Related Product Information

Product Code	Description	Document Number
R485	2.5 Gbits/s Receiver with Clock Recovery	DS01-005OPTO
R480	2.5 Gbits/s Receiver with CML Data Output	DS01-011OPTO

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