

## PLA-8XX – Sub-Nanosecond, High Sensitivity APD Front End Receiver Module

### Product Features

- 80  $\mu\text{m}$  InGaAs APD
- ultra-low noise TIA
- 500 MHz bandwidth
- Overload protection circuitry
- Industry leading sensitivity and overload performance
- Small form-factor



*Princeton Lightwave's PLA-8XX series APD with transimpedance amplifier product family offers industry-leading sensitivity in multiple packaging formats. These modules leverage PLI's high performance, planar InP-InGaAs avalanche photodiodes (APDs) developed specifically for demanding low light level detection in ranging, LADAR and scientific applications.*

### Applications

- Laser Radar (LADAR) and Ranging
- Low-level Optical Pulse Discrimination
- Free-space Optical Communication
- Optical Time Domain Reflectometry
- Confocal Microscopy

The PLA-841 incorporates the above features in a 6-pin, TO-46 style package. It achieves a 500-MHz bandwidth, enabling sub-nanosecond timing accuracy. The ultra low-noise amplifier, in combination with the low dark current of the APD, offers excellent low light-level performance over a wide operating temperature range. The APD module also includes circuitry for overload protection of the receiver, and to enhance recovery from high optical input pulses. The combination of minimal dependence on temperature variation, un-cooled operation and compact packaging enables significant SWaP (size, weight and power) advantages.

For more demanding applications where the dependence of the APD operating voltage on temperature must be controlled by temperature stabilization, the PLA-83X and PLA-86X version incorporate, in a flanged packaging format, the receiver performance of the PLA-841 with an internal thermo-electric cooler (TEC) and temperature sensor. The PLA-??? is a TO-37 module designed to provide a compactness approaching that of the PLA-841 (ref TO-46) while providing an internal TEC. The PLA-86X receiver is a TO-66 module, also with an internal TEC, designed to provide form-factor compatibility with legacy systems.

All modules have pin-out and form-factor compatibility with PLI's line of 100-MHz High-Sensitivity APD Front End Receiver Modules for near-perfect interchangeability.



All versions are assembled in a hermetic enclosure, and incorporate packaging designs and processes that ensure robust, reliable operation in harsh environments.

### **PERFORMANCE SPECIFICATIONS: PLA-8XX**

Operating conditions: VDD=+3.3V to GND; Case temperature = 25°C; R<sub>LOAD</sub>=150 Ω differential

Parameter Description	Test Conditions	Specifications			Units
		Min	Typical	Max	
Effective Optical Diameter	80μm APD		80		μm
Breakdown voltage, V <sub>b</sub>	I <sub>d</sub> = 10 μA	50		90	V
Temp. dependence ΔV <sub>b</sub> /ΔT			0.15		V/°C
Impulse Response (FWHM)	M=10, 80μm APD		1		ns
Bandwidth (3dB, optical)	M=10, 80μm APD		550		MHz
Responsivity @ 1550 nm	Differential output, M=10		165		kV/W
	Single-ended output, M=10		82.5		
Dark noise equivalent power <sup>†</sup>	1550 nm, M=10		250		fW/√Hz
Output Impedance	Differential output		150		Ω
	Single-ended output		75		
Output voltage swing	Differential output		0.46		Vp-p
	Single-ended output		0.23		
Dynamic range	1550 nm, M=10		20		dB
Power supply current	0nW optical input		25		mA
TEC Voltage <sup>††</sup>				0.6	V
TEC Current <sup>††</sup>				0.6	A

† NEP computed with measured output noise, with no optical illumination, divided by responsivity.

†† For PLA-86X versions only, enables above performance across operating case temperature range of -40°C to + 85°C

### **ABSOLUTE MAXIMUM RATINGS**

Parameter	Min	Max	
Supply Voltage <sup>1</sup> (+3.3V)	-0.5	4	Volt
APD Reverse Bias <sup>3</sup>	0	Vbr	Volt
Limiter Voltage	0	2.5	Volt
TIA Output Voltage	-0.5	Vdd	Volt
Tsens Current		1	mAmp
TEC Voltage		1	Volt
TEC Current		1	Amp

1 Should be applied after APD reverse bias.

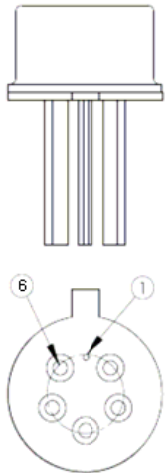
2 APD Reverse Bias should be applied before TIA supply voltage

**PRODUCT HANDLING**

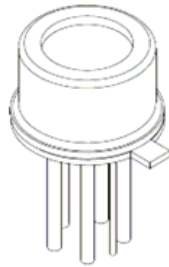
These avalanche photodiodes are sensitive to electrostatic discharge (ESD) and should be handled with appropriate caution, including the use of ESD protective equipment such as grounding straps and anti-static mats.

**MECHANICAL SPECIFICATIONS: PLA-841**

PLA-841 is a 6-pin TO-46 module.

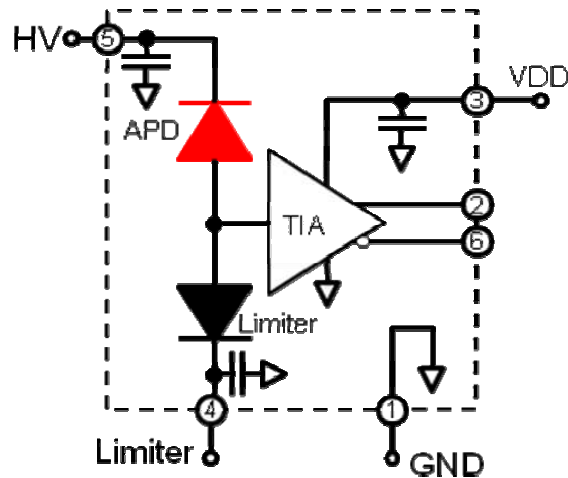


Bottom view



Pin	Function
1	CASE GND
2	OUT+
3	VDD
4	LIMITER
5	+HV
6	OUT-

**ELECTRICAL BLOCK DIAGRAM: PLA 841**

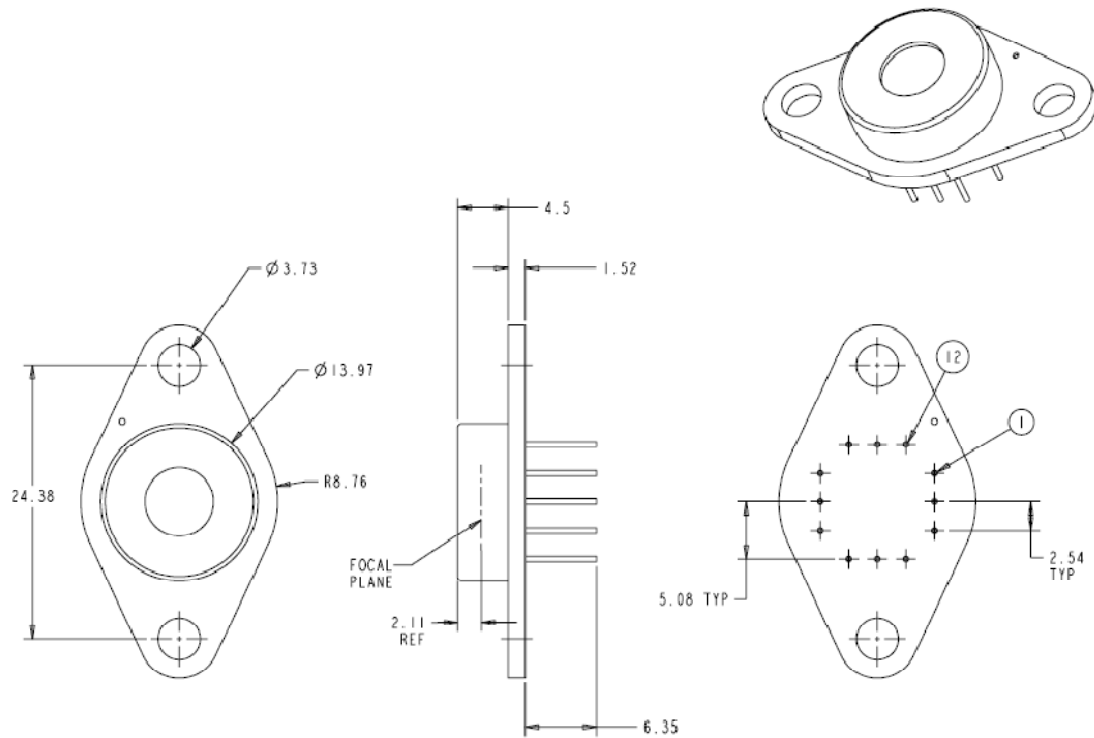


**LIMITER**

LIMITER is a control voltage that manages overload protection and recovery of the APD and TIA. Effective overload recovery is achieved by applying fixed voltage so that the limiter diode is zero-biased (typical 0.9V). Alternatively, the pin may be left unconnected, allowing the internal capacitor to hold the zero-bias voltage.

**MECHANICAL SPECIFICATIONS: PLA-861**

The PLA-861 is a 12-pin TO-66 module. All dimensions are in millimeters.



Pin	Function
1	NC
2	-TEC
3	+TEC
4	TSENS1
5	TSENS2
6	CASE GND
7	+HV (APD Cathode)
8	OUT-
9	OUT+
10	VDD
11	N.C.
12	LIMITER