

**APD110C/M - September 12, 2019**

Item # APD110C/M was discontinued on September 12, 2019. For informational purposes, this is a copy of the website content at that time and is valid only for the stated product.

**INGAAS AVALANCHE PHOTODETECTORS**

- ▶ High-Speed Response up to 1 GHz
- ▶ Conversion Gains up to  $9.0 \times 10^6$  V/W
- ▶ Wavelength Ranges Covering 850 to 1700 nm
- ▶ Temperature-Compensated and Variable Gain Versions Available



**APD110C**  
Standard APD



**APD130C**  
Temperature-Compensated APD



**APD430C**  
Variable-Gain,  
Temperature-Compensated APD



**APD310**  
High-Speed APD

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**OVERVIEW**

**Features**

- Noise Equivalent Powers (NEP) as Low as 0.12 pW/√Hz
- Max Bandwidth up to 1 GHz at 3 dB
- Temperature-Compensated Versions Provide M Factor Stability of  $\pm 3\%$  Over 18 to 28 °C
- Variable Gain Detectors Available: M Factor from 4 to 20 or 2 to 10
- Internal SM05 and External SM1 Threading for Lens Tubes
- Power Supply Included

Thorlabs' InGaAs Avalanche photodetectors (APDs) are designed to offer increased sensitivity and lower noise compared to standard PIN detectors, making them ideal for applications with low optical power levels. In addition to our standard APDs, versions featuring variable gain (i.e., M factor) and/or temperature compensation are offered.

In general, avalanche photodiodes use an internal gain mechanism to increase sensitivity. A high reverse bias voltage is applied to the diodes to create a strong electric field. When an incident photon generates an electron-hole pair, the electric field accelerates the electrons, leading to the production of secondary electrons by impact ionization. The resulting electron avalanche can produce a gain factor of several hundred times, described by a multiplication factor, M, that is a function of both the reverse bias voltage and temperature. In general, the M

**InGaAs APD Selection Guide**

Item #	Wavelength Range	Bandwidth (3 dB)	Type (Quick Links)
<b>APD110C(M)</b>	900 - 1700 nm	DC - 50 MHz	Standard
<b>APD130C(M)</b>			Temperature Compensated
<b>APD410C(M)</b>		DC - 10 MHz	Variable Gain, Temperature Compensated
<b>APD430C(M)</b>		DC - 400 MHz	
<b>APD450C</b>	1260 - 1620 nm	0.3 - 1600 MHz	
<b>APD310</b>	850 - 1650 nm	5 - 1000 MHz	Variable Gain

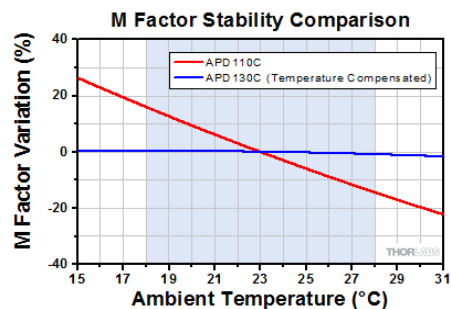
factor increases with lower temperatures and decreases with higher temperatures. Similarly, the M factor will increase when the reverse bias voltage is raised and decrease when the reverse bias voltage is lowered.

Our APD130C(/M) temperature-compensated APD features an integrated thermistor that adjusts the bias voltage to compensate for the effect of temperature changes on the M factor. A comparison with our non-temperature-compensated APDs is provided in the graph to the right.

In addition to being temperature compensated, the APD410C(/M), APD430C(/M), and APD450C variable-gain APDs allow the reverse bias voltage across the diode to be adjusted via a rotary knob on the side of the housing, which varies the M factor continuously from 4 to 20.

For extremely light-sensitive applications, Thorlabs offers Menlo Systems' APD310 variable-gain, high-sensitivity avalanche photodetector, which offers high-speed response up to 1 GHz.

A complete list of all of our APDs, including those that have a silicon photodiode for use at UV and visible wavelengths, can be found on the *Selection Guide* tab. Please note that these packaged APDs are not suitable for use as single photon counters. Thorlabs has single photon counters available here.



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The above plot shows sample data comparing the M factor stability of our temperature-compensated avalanche photodetectors to our standard packages. The blue shaded region indicates the temperature range over which the M factor stability is guaranteed to within ±3%.

[Hide APDxxxC Specs](#)

## APDXXXC SPECS

Item #	APD110C(/M)	APD130C(/M)	APD410C(/M)	APD430C(/M)	APD450C
<b>Detector Type</b>	InGaAs APD				
<b>Wavelength Range</b>	900 - 1700 nm				1260 - 1620 nm
<b>Output Bandwidth (3 dB)</b>	DC - 50 MHz		DC - 10 MHz	DC - 400 MHz	0.3 - 1600 MHz
<b>Active Area Diameter</b>	0.2 mm				75 $\mu$ m with $\varnothing$ 1.5 mm Ball Lens
<b>Typical Max Responsivity</b>	9 A/W @ 1500 nm (M = 10) <sup>a</sup>		18 A/W @ 1550 nm (M = 20)		9 A/W @ 1550 nm (M = 10)
<b>Responsivity Graph (Click to View)</b>					
<b>M Factor<sup>b</sup></b>	10		4 - 20 (Continuously Adjustable)		2 - 10 (Continuously Adjustable)
<b>M Factor Temperature Stability<sup>c</sup></b>	Not Specified	$\pm$ 2% (Typical); $\pm$ 3% (Max)			
<b>Transimpedance Gain</b>	50 kV/A (50 $\Omega$ Termination) <sup>d</sup> 100 kV/A (High-Z Termination)		250 kV/A (50 $\Omega$ Termination) <sup>d</sup> 500 kV/A (High-Z Termination)	5 kV/A (50 $\Omega$ Termination) <sup>d</sup> 10 kV/A (High-Z Termination)	
<b>Max Conversion Gain<sup>e,f</sup></b>	$0.9 \times 10^6$ V/W		$9.0 \times 10^6$ V/W	$1.8 \times 10^5$ V/W	
<b>CW Saturation Power</b>	4.2 $\mu$ W		0.45 $\mu$ W @ 1550 nm (M = 20) 2.25 $\mu$ W @ 1550 nm (M = 4)	22 $\mu$ W @ 1550 nm (M = 20) 110 $\mu$ W @ 1550 nm (M = 4)	
<b>Max Input Power<sup>g</sup></b>	1 mW				
<b>Minimum NEP<sup>h</sup></b>	0.46 pW/ $\sqrt$ Hz (DC - 50 MHz)		0.12 pW/ $\sqrt$ Hz (DC - 10 MHz)	0.45 pW/ $\sqrt$ Hz (DC - 100 MHz)	
<b>Integrated Noise<sup>i</sup></b>	3.3 nW (RMS, DC - 50 MHz)		0.38 nW (RMS, DC - 10 MHz)	17 nW (RMS, DC - 400 MHz)	
	35 pW (0.3 - 1600 MHz)				

Electrical Output	50 Ω BNC		50 Ω SMA
Max Output Voltage Swing	1.8 V (50 Ω Termination) 3.6 V (High-Z Termination)	2.0 V (50 Ω Termination) 4.1 V (High-Z Termination)	2.0 V (50 Ω Termination)
DC Offset Electrical Output	< ±15 mV	< ±25 mV	< ±3 mV
Included Power Supply <sup>j</sup>	±12 V @ 250 mA (100/120/230 VAC, 50 - 60 Hz, Switchable)		
<b>General</b>			
Operating Temperature Range	0 to 40 °C (Non-Condensing)		
Storage Temperature Range	-40 to 70 °C		
Dimensions (H x W x D)	2.97" x 2.00" x 1.08" (75.5 mm x 50.8 mm x 27.4 mm)	2.97" x 2.20" x 1.09" (75.5 mm x 55.8 mm x 27.6 mm)	2.83" x 2.22" x 1.08" (72.0 mm x 56.3 mm x 27.4 mm)

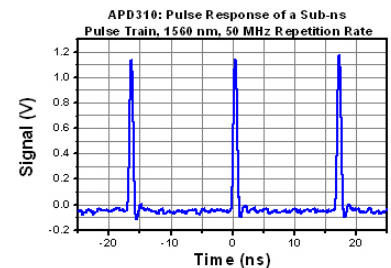
- a. These detectors are factory set to M = 10, but other M factors are available on request. Please contact techsupport@thorlabs.com for more information.
- b. The responsivity scales with the M factor, which is dependent on the reverse bias voltage across the photodiode. For a given photodiode, a higher M factor corresponds to a higher reverse bias voltage, which increases the photodiode responsivity. By definition, M = 1 corresponds to a reverse bias voltage of 0 V.
- c. Within the 23 ± 5 °C temperature range.
- d. 50 Ω termination is recommended for the best performance.
- e. At the Peak Responsivity Wavelength.
- f. The Conversion Gain is product of the Transimpedance Gain and the Responsivity for a given M factor and wavelength.
- g. This value is the damage threshold for the photodiode.
- h. For more information on how NEP is calculated, please see Thorlabs' Noise Equivalent Power White Paper.
- i. At Maximum Gain Settings
- j. A replacement power supply is available below.

All technical data are valid at 23 ± 2 °C (APD110C) or 23 ± 5 °C (APD130C, APD410C, APD430C, and APD450C) and 45% ± 15% relative humidity (non-condensing).

[Hide APD310 Specs](#)

## APD310 SPECS

Item #	APD310
Detector Type	InGaAs APD
Wavelength Range	850 - 1650 nm
Bandwidth	5 MHz - 1000 MHz (3 dB) 1 MHz - 1800 MHz (Max)
Active Area Diameter	0.03 mm
Optical Input	Free Space <sup>a</sup>
Conversion Gain (Max) <sup>b</sup>	2.5 x 10 <sup>4</sup> V/W @ 1 GHz, 1500 nm
Max Input Power	10 mW
NEP (Calculated) <sup>c</sup>	2 pW/√Hz
Rise Time	500 ps
Dark State Noise Level <sup>d</sup>	-80 dBm
Operating Temperature	10 - 40°C
Electrical Output	BNC, 50 Ω
Output Coupling	AC
Current Consumption	200 mA
Supply Voltage	12 - 15 V <sup>e</sup>
Dimensions	2.4" x 2.2" x 1.87" (60 mm x 56 mm x 47.5 mm)

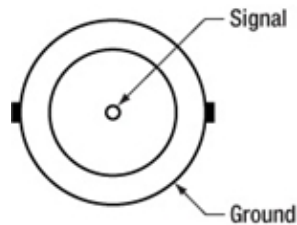


- a. With adapter for Thorlabs' SM05 Mount
- b. Gain Adjustable via Push Buttons
- c. The noise-equivalent power is a measure of the detector's minimum detectable power per square root of bandwidth. Since this value only depends on the detector itself, it can be used to compare two detectors that do not have the same integration time. The smaller the NEP value, the better the detector.
- d. This is a measure of the noise when no light is incident on the detector's photosensitive area. Span: 5 MHz, Resolution Bandwidth: 3 kHz
- e. Power supply included with adapters for EU/USA.

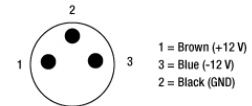
[Hide Pin Diagrams](#)

## PIN DIAGRAMS

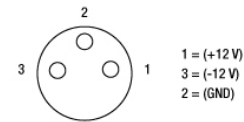
### BNC Female Output (Photodetector)



### APD Male (Power Cables)



### APD Female (Photodetector)



[Hide Fiber Coupling](#)

## FIBER COUPLING

### Fiber Coupling

In fiber coupling applications, we recommend taking into account the divergence of light from the fiber tip to ensure that all of the signal is focused onto the detector active area. When using a standard fiber connector adapter with a detector with an active area smaller than  $\varnothing 1$  mm, high coupling losses and degradation of the frequency response may occur.



Click to Enlarge  
Output from a fiber is coupled into the photodetector using an aspheric lens to focus the signal onto the detector active area.

To achieve high coupling efficiency, a fiber collimation package, focusing lens, and X-Y translator should be used, as shown in the photo to the right. The avalanche photodetector is shown with a fiber collimator, lens tube collimator adapter, lens tube, and X-Y translation mount. An adapter inside the lens tube holds an aspheric lens (not visible) to focus the collimated light onto the active area of the detector. The X-Y translation mount corrects for any centering issues.

### Components for Fiber Coupling

Item #	Description
-	Avalanche Photodetector
LM1XY(/M)	Translating Lens Mount for $\varnothing 1$ " Optics
SM1L10	SM1 (1.035"-40) Lens Tube, 1" Long
-	Fiber Collimator (Dependent on Fiber)
AD11F or AD12F	SM1-Threaded Adapters for $\varnothing 11$ or $\varnothing 12$ mm Fiber Collimators (Dependent on Collimator)
-	Mounted Molded Aspheric Lens (Dependent on Collimator)
S1TM06, S1TM08, S1TM09, S1TM10, or S1TM12	SM1-Threaded Adapter for Molded Aspheric Lens Cell (Dependent on Lens)

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## SELECTION GUIDE

### Avalanche Photodetector Selection Guide

Item #	Detector Type	Wavelength Range	3 dB Bandwidth	Active Area Diameter	M Factor	Typical Max Responsivity	Max Conversion Gain <sup>a</sup>	Temperature Compensated	Variable Gain
APD440A2	UV Enhanced Silicon APD	200 - 1000 nm	DC - 0.1 MHz	1 mm	5 - 50	25 A/W @ 600 nm (M = 50)	1.25 x 10 <sup>9</sup> V/W	✓	✓
APD410A2			DC - 10 MHz	0.5 mm	5 - 50	25 A/W @ 600 nm (M = 50)	12.5 x 10 <sup>6</sup> V/W	✓	✓
APD120A2			DC - 50 MHz	1 mm	50	25 A/W @ 600 nm (M = 50)	2.5 x 10 <sup>6</sup> V/W	-	-
APD130A2			DC - 50 MHz	1 mm	50	25 A/W @ 600 nm (M = 50)	2.5 x 10 <sup>6</sup> V/W	✓	-
APD430A2			DC - 400 MHz	0.2 mm	10 - 100	50 A/W @ 600 nm (M = 100)	5.0 x 10 <sup>5</sup> V/W	✓	✓
APD440A	Silicon APD	400 - 1000 nm	DC - 0.1 MHz	1 mm	10 - 100	53 A/W @ 800 nm (M = 100)	2.65 x 10 <sup>9</sup> V/W	✓	✓
APD410A			DC - 10 MHz	1.0 mm	10 - 100	53 A/W @ 800 nm (M=100)	26.5 x 10 <sup>6</sup> V/W	✓	✓
APD120A			DC - 50 MHz	1 mm	50	25 A/W @ 800 nm (M = 50)	2.5 x 10 <sup>6</sup> V/W	-	-
APD130A			DC - 50 MHz	1 mm	50	25 A/W @ 800 nm (M = 50)	2.5 x 10 <sup>6</sup> V/W	✓	-
APD430A			DC - 400 MHz	0.5 mm	10 - 100	53 A/W @ 800 nm (M = 100)	5.3 x 10 <sup>5</sup> V/W	✓	✓
APD210			5 - 1000 MHz <sup>b</sup>	0.5 mm	N/A	N/A	2.5 x 10 <sup>5</sup> V/W <sup>c</sup>	-	✓
APD110C	InGaAs APD	900 - 1700 nm	DC - 50 MHz	0.2 mm	10	9 A/W @ 1500 nm (M = 10)	0.9 x 10 <sup>6</sup> V/W	-	-
APD130C			DC - 50 MHz	0.2 mm	10	9 A/W @ 1500 nm (M = 10)	0.9 x 10 <sup>6</sup> V/W	✓	-
APD410C			DC - 10 MHz	0.2 mm	4 - 20	18 A/W @ 1550 nm (M = 20)	9.0 x 10 <sup>6</sup> V/W	✓	✓
APD430C			DC - 400 MHz	0.2 mm	4 - 20	18 A/W @ 1550 nm (M = 20)	1.8 x 10 <sup>5</sup> V/W	✓	✓
APD450C		1260 - 1620 nm	0.3 - 1600 MHz	1.5 mm <sup>d</sup>	2 - 10	9 A/W @ 1550 nm (M = 10)	45 x 10 <sup>3</sup> V/W	✓	✓
APD310		850 - 1650 nm	5 - 1000 MHz <sup>e</sup>	0.03 mm	N/A	N/A	2.5 x 10 <sup>4</sup> V/W <sup>f</sup>	-	✓

a. At Peak Responsivity Wavelength Unless Otherwise Stated

b. The max frequency range is 1 MHz - 1600 MHz.

c. At 1 GHz and 800 nm

d. 75 µm Detector with Ø1.5 mm Ball Lens

e. The max frequency range is 1 MHz - 1800 MHz.

f. At 1 GHz and 1500 nm

[Hide InGaAs Avalanche Photodetectors](#)

## InGaAs Avalanche Photodetectors

- ▶ Internal SM05 and External SM1 Threads Accept Fiber Adapters, Lens Tubes, and Other Components
- ▶ Power Supply Included

Thorlabs' APD110C(/M) Avalanche Photodetector is offered as a cost-effective solution for customers with applications that do not require temperature compensation or variable gain.


The orientation of the mechanical and electrical connections, combined with the

Key Specifications <sup>a</sup>	
Item #	APD110C(/M)
Detector Type	InGaAs APD
Wavelength Range	900 - 1700 nm
Output Bandwidth (3 dB)	DC - 50 MHz
Active Area Diameter	0.2 mm

compact design, ensures that these detectors can fit into tight spaces. Three 8-32 (M4) mounting holes, one on each edge of the housing, further ensure easy integration into complicated mechanical setups. The housing also provides compatibility with both our SM05 and SM1 Lens Tubes. An internally SM1-threaded cap is included.

**Fiber Coupling Note:**

For fiber-coupled applications, we do not recommend using fiber connector adapters such as Thorlabs' S120-FC due to the small size of the detector. High coupling losses and degradation of the frequency response may occur. To achieve high coupling efficiency, a fiber collimation package, focusing lens, and X-Y translator should be used. See the *Fiber Coupling* tab for details.

<b>Typical Max Responsivity</b>	9 A/W @ 1500 nm
<b>Responsivity Graph (Click to View)</b>	
<b>Transimpedance Gain</b>	50 kV/A (50 Ω Termination) 100 kV/A (High-Z Termination)
<b>Max Conversion Gain<sup>b</sup></b>	$0.9 \times 10^6$ V/W
<b>M Factor</b>	10
<b>M Factor Temperature Stability</b>	Not Specified
<b>Saturation Power (CW)</b>	4.2 μW
<b>Minimum NEP (DC - 50 MHz)<sup>b</sup></b>	0.46 pW/√Hz
<b>Dimensions (W x H x D)</b>	2.97" x 2.00" x 1.08"

- a. For a complete list of specifications and responsivity graphs, please see the *APDxxxC Specs* tabs. Data are valid at  $23 \pm 2$  °C and 45% ± 15% relative humidity (non-condensing).
- b. For more information on how NEP is calculated, please see Thorlabs' Noise Equivalent Power White Paper.

Part Number	Description	Price	Availability
APD110C	InGaAs Avalanche Photodetector, 900 - 1700 nm, 8-32 Taps	\$2,379.58	Today

[Hide Temperature-Compensated InGaAs Avalanche Photodetectors](#)

**Temperature-Compensated InGaAs Avalanche Photodetectors**


- ▶ Temperature Compensated to Provide M Factor Stability of  $\pm 3\%$  Over 18 to 28 °C
- ▶ Internal SM05 and External SM1 Threads Accept Fiber Adapters, Lens Tubes, and Other Components
- ▶ Power Supply Included

Thorlabs' APD130C(M) Avalanche Photodetector features an integrated thermistor that maintains an M factor stability of  $\pm 3\%$  or better over  $23 \pm 5$  °C by adjusting the bias voltage across the avalanche photodiode, supplying improved output stability in environments with temperature variations.

The orientation of the mechanical and electrical connections, combined with the compact design, ensures that these detectors can fit into tight spaces. Three 8-32 (M4) mounting holes, one on each edge of the housing, further ensure easy integration into complicated mechanical setups. The housing also provides compatibility with both our SM05 and SM1 Lens Tubes. An internally SM1-threaded cap is included.

**Fiber Coupling Note:**

For fiber-coupled applications, we do not recommend using fiber connector adapters such as Thorlabs' S120-FC due to the small size of the detector. High coupling losses and degradation of the frequency response may occur. To achieve high coupling efficiency, a fiber collimation package, focusing lens, and X-Y translator should be used. See the *Fiber Coupling* tab for details.

Key Specifications <sup>a</sup>	
Item #	APD130C(M)
<b>Detector Type</b>	InGaAs APD
<b>Wavelength Range</b>	900 - 1700 nm
<b>Output Bandwidth (3 dB)</b>	DC - 50 MHz
<b>Active Area Diameter</b>	0.2 mm
<b>Typical Max Responsivity</b>	9 A/W @ 1500 nm (M = 10)
<b>Responsivity Graph (Click to View)</b>	
<b>Transimpedance Gain</b>	50 kV/A (50 Ω Termination) 100 kV/A (High-Z Termination)
<b>Max Conversion Gain<sup>b</sup></b>	$0.9 \times 10^6$ V/W
<b>M Factor</b>	10
<b>M Factor Temperature Stability<sup>c</sup></b>	$\pm 2\%$ (Typical); $\pm 3\%$ (Max)
<b>Saturation Power (CW)</b>	4.2 μW
<b>Minimum NEP (DC - 50 MHz)<sup>d</sup></b>	0.46 pW/√Hz
<b>Dimensions (W x H x D)</b>	2.97" x 2.00" x 1.08"

- a. For a complete list of specifications and responsivity graphs, please see the *APDxxxC Specs* tab. Data are valid at  $23 \pm 5$  °C and 45% ± 15% relative humidity (non-condensing).
- b. At the Peak Responsivity Wavelength
- c. Within the  $23 \pm 5$  °C temperature range.
- d. For more information on how NEP is calculated, please see Thorlabs' Noise Equivalent Power White Paper.

Part Number	Description	Price	Availability

APD130C/M	InGaAs Avalanche Photodetector, Temperature Compensated, 900 - 1700 nm, M4 Taps	\$2,434.77	Today
APD130C	InGaAs Avalanche Photodetector, Temperature Compensated, 900 - 1700 nm, 8-32 Taps	\$2,434.77	Today

[Hide Variable-Gain, Temperature-Compensated Avalanche Photodetectors](#)

## Variable-Gain, Temperature-Compensated Avalanche Photodetectors

- ▶ Continuously Variable Gain
- ▶ Temperature Compensated to Provide M Factor Stability of  $\pm 3\%$  Over 18 to 28 °C
- ▶ Internal SM05 and External SM1 Threads Accept Fiber Adapters, Lens Tubes, and Other Components
- ▶ Power Supply Included




Click to Enlarge  
The M Factor is controlled by a knob on the side of the APD.

Thorlabs' APD410C(/M), APD430C(/M), and APD450C Avalanche Photodetectors have a variable gain that can be controlled by a knob on the right side of the housing. The gain knob adjusts the reverse bias voltage across the photodiode, allowing the M factor to vary. Like the APD130C detectors above, these devices feature an integrated thermistor that maintains an M factor stability of  $\pm 3\%$  or better over  $23 \pm 5$  °C by adjusting the bias voltage across the avalanche photodiode. These detectors offer different bandwidth ranges and sensitivity.

The orientation of the mechanical and electrical connections, combined with the compact design, ensures that these detectors can fit into tight spaces. Three 8-32 (M4) mounting holes, one on each edge of the APD410C(/M) and APD430C(/M) housing, further ensure easy integration into complicated mechanical setups. The APD450C detector offers universal 8-32/M4 mounting holes. The housing also provides compatibility with both our SM05 and SM1 Lens Tubes. An internally SM1-threaded cap is included.

### Fiber Coupling Note:

For fiber-coupled applications, we do not recommend using fiber connector adapters such as Thorlabs' S120-FC with the APD410C or APD430C detectors due to the small size of the sensors. High coupling losses and degradation of the frequency response may occur. To achieve high coupling efficiency, a fiber collimation package, focusing lens, and X-Y translator should be used. See the *Fiber Coupling* tab for details.

Key Specifications <sup>a</sup>			
Item #	APD410C(/M)	APD430C(/M)	APD450C
Detector Type	InGaAs APD		
Wavelength Range	900 - 1700 nm		1260 - 1620 nm
Output Bandwidth (3 dB) <sup>b</sup>	DC - 10 MHz	DC - 400 MHz	0.3 - 1600 MHz
Active Area Diameter	0.2 mm		75 $\mu$ m, with $\varnothing$ 1.5 mm Ball Lens
Typical Max Responsivity	18 A/W @ 1550 nm (M = 20)		9 A/W @ 1550 nm (M = 10)
Responsivity Graph (Click to View)			
Transimpedance Gain	250 kV/A (50 $\Omega$ Termination) 500 kV/A (High-Z Termination)	5 kV/A (50 $\Omega$ Termination) 10 kV/A (High-Z Termination)	5 kV/A (50 $\Omega$ Termination)
Max Conversion Gain <sup>c</sup>	$9.0 \times 10^6$ V/W	$1.8 \times 10^5$ V/W	$4.5 \times 10^4$ V/W (50 $\Omega$ Termination)
M Factor Adjustment Range	4 - 20 (Continuous)		2 - 10 (Continuous)
M Factor Temperature Stability <sup>d</sup>	$\pm 2\%$ (Typical); $\pm 3\%$ (Max)		
Saturation Power (CW)	0.45 $\mu$ W @ 1550 nm (M = 20) 2.25 $\mu$ W @ 1550 nm (M = 4)	22 $\mu$ W @ 1550 nm (M = 20) 110 $\mu$ W @ 1550 nm (M = 4)	0.1 mW @ 1550 nm (M = 10) 0.5 mW @ 1550 nm (M = 2)
Minimum NEP <sup>e</sup>	0.12 pW/ $\sqrt$ Hz (DC - 10 MHz)	0.45 pW/ $\sqrt$ Hz (DC - 100 MHz)	1.1 pW/ $\sqrt$ Hz (0.3 - 1600 MHz)
Dimensions (W x H x D)	2.97" x 2.20" x 1.09"		2.83" x 2.22" x 1.08"

- a. For a complete list of specifications and responsivity graphs, please see the APDxxxC Specs tab. Data are valid at  $23 \pm 5$  °C and  $45\% \pm 15\%$  relative humidity (non-condensing).
- b. At Maximum Gain Setting
- c. At the Peak Responsivity Wavelength
- d. Within the  $23 \pm 5$  °C temperature range.
- e. For more information on how NEP is calculated, please see Thorlabs' Noise Equivalent Power White Paper.

Part Number	Description	Price	Availability
APD410C/M	InGaAs Variable-Gain Avalanche Photodetector, Temperature Compensated, 900 - 1700 nm, DC - 10 MHz, M4 Taps	\$2,489.95	Today
APD430C/M	InGaAs Variable-Gain Avalanche Photodetector, Temperature Compensated, 900 - 1700 nm, DC - 400 MHz, M4 Taps	\$2,489.95	Today
APD450C	NEW! Customer Inspired! InGaAs Variable-Gain Avalanche Photodetector, Temperature Compensated, 1260 - 1620 nm, 0.3 - 1600 MHz, Universal 8-32 / M4 Taps	\$1,709.80	5-8 Days
APD410C	InGaAs Variable-Gain Avalanche Photodetector, Temperature Compensated, 900 - 1700 nm, DC - 10 MHz, 8-32 Taps	\$2,489.95	Today
APD430C	InGaAs Variable-Gain Avalanche Photodetector, Temperature Compensated, 900 - 1700 nm, DC - 400 MHz, 8-32 Taps	\$2,489.95	Today

[Hide Variable-Gain Avalanche Photodetector](#)

### Variable-Gain Avalanche Photodetector

- ▶ High-Speed Avalanche Photodetector (up to 1 GHz at 3 dB)
- ▶ 100 Step Adjustable Gain
- ▶ Internal SM05 (0.535"-40) Threads for Lens Tube Integration
- ▶ Power Supply Included

Menlo Systems' APD310 InGaAs Avalanche Photodetector provides an extremely light-sensitive alternative to traditional PIN photodiodes and is sensitive and fast enough for the characterization of pulsed lasers on the order of nanoseconds. The InGaAs avalanche photodiode of the APD310 provides exceptional performance for low-light applications in the 850 - 1650 nm range. This APD maintains high-gain stability over the operating temperature range by utilizing a temperature-compensation circuit, which adjusts the ~150 VDC bias to ensure operation near the breakdown voltage.

A 40 dB gain amplifier is integrated into the housing and is AC-coupled to band the output BNC. The output is matched to 50  $\Omega$  impedance. The detector has an electronic bandwidth of 5 MHz to 1 GHz (at 3 dB) and offers user-accessible push buttons providing 100 step gain adjustment. The APD310 has SM05 (0.535"-40) threads for easy integration into Thorlabs' family of lens tubes and cage assemblies. For direct fiber mounting, compatible fiber adapters are available. The bottom of the detector has a metric (M4) mounting hole and an M4 to 8-32 adapter for post mounting. The compact packaging allows the APD to be substituted directly into an existing setup while maintaining a small footprint on the benchtop. A location-specific power adapter is included with the detector; contact Technical Support for more information.

These photodetectors are not suitable for pulses longer than 30 ns or continuous light levels. Please see the FPD510 series for alternatives.

Key Specifications <sup>a</sup>	
Item #	APD310
Detector Type	InGaAs APD
Wavelength Range	850 - 1650 nm
Output Bandwidth	5 MHz - 1000 MHz (3 dB) 1 MHz - 1800 MHz (Max)
Active Area Diameter	0.03 mm
Transimpedance Gain	Variable
Max Conversion Gain	$2.5 \times 10^4$ V/W
M Factor Temperature Stability	Not Specified
Minimum NEP <sup>b</sup>	2 pW/ $\sqrt{\text{Hz}}$

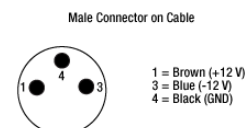
- a. For a complete list of specifications and responsivity graphs, please see the *APD310 Specs* tab.
- b. For more information on how NEP is calculated, please see Thorlabs' Noise Equivalent Power White Paper.

Part Number	Description	Price	Availability
APD310	High-Speed InGaAs Avalanche Detector, 850 - 1650 nm	\$2,640.00	Today

[Hide  \$\pm 12\$  VDC Regulated Linear Power Supply](#)

### $\pm 12$ VDC Regulated Linear Power Supply

- ▶ Replacement Power Supply for Avalanche Photodetectors Sold Above (Except Item # APD310)
- ▶  $\pm 12$  VDC Power Output
- ▶ Current Limit Enabling Short Circuit and Overload Protection
- ▶ On/Off Switch with LED Indicator
- ▶ Switchable AC Input Voltage (100, 120, or 230 VAC)
- ▶ 2 m (6.6 ft) Cable with LUMBERG RSMV3 Male Connector
- ▶ UL and CE Compliant





The LDS12B  $\pm 12$  VDC Regulated Linear Power Supply is intended as a replacement for the supply included with our APD series of avalanche photodetectors sold on this page, except for the APD310 photodetector. The cord has three pins: one for ground, one for +12 V, and one for -12 V (see diagram above). This power supply ships with a location-specific power cord. This power supply can also be used with the PDA series of amplified photodetectors, PDB series of balanced photodetectors, PMM series of photomultiplier modules, and the FSAC autocorrelator for femtosecond lasers.

Part Number	Description	Price	Availability
LDS12B	$\pm 12$ VDC Regulated Linear Power Supply, 6 W, 100/120/230 VAC	\$85.22	Today