High-Speed Fiber Optical InGaAs Bias Detectors

4GHz, 800-1700nm, powered by battery or DC supply

DATASHEET

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The HSDT series High-Speed Fiber-Coupled Detectors are engineered for high-fidelity response at bandwidths exceeding 1 GHz. Unlike amplified detectors, which can distort signals, especially at high frequencies due to their amplification circuitry, the HSDT operates with a low-noise DC bias, avoiding such distortions. This makes it ideal for measuring fast signal transients, providing a linear response to incident light. The HSDT operates in photoconductive mode, using reverse bias from either an internal battery or a DC power supply, where incoming light generates a current flow. A parallel resistor can be added to convert the detector current into a voltage, maximizing response. For optimal performance, particularly due to cabling effects, a 50-ohm resistor should be used at the oscilloscope input. We offer a BNC 50-ohm dummy resistor for this purpose. For measuring laser pulses longer than 500 ns, a parallel resistor between 1k and 10k ohms is recommended.

The h signal is output through an SMA connector, allowing easy monitoring with an oscilloscope or other measurement electronics. The unit includes a built-in battery with a twist switch for convenient operation, along with a connector for an external DC power supply. An optional wall-pluggable DC power supply is also available. The HSDT detectors are ideal for test and measurement applications, including research in data communications, analog microwaves, and high-speed photonics.

Features

- Low Signal Distortion
- High Bandwidth 4GHz
- Fiber Coupled
- Power Supplier Operation
- Battery Operation
- Fast Response

Applications

- General Lab Use
- Instruments

Specifications

Parameter	Min	Typical	Max	Unit
Detector Diameter		80		μm
Wavelength Response	800		1700	nm
Peak Response [1]		0.9		A/W
Capacitance		0.3		pF
Rise/Fall Time [2]		80		ps
Bandwidth [3]	DC	1.25	4	GHz
NEP [1]		$2x10^{-15}$		$W/Hz^{1/2}$
Dark Current		1.5		nA
Optical Damage Threshold	50			mW
Operating Temperature	0		50	°C
Optical Input		FC		
Electric Output (DC Coupled)		SMA		
Battery		A23, 12V, 40mAh		

Notes:

[1]. @1550nm

[2]. 80/20%

[3]. Defined as the boundary at which the output is 3dB below the normal output

Rev 11/14/24

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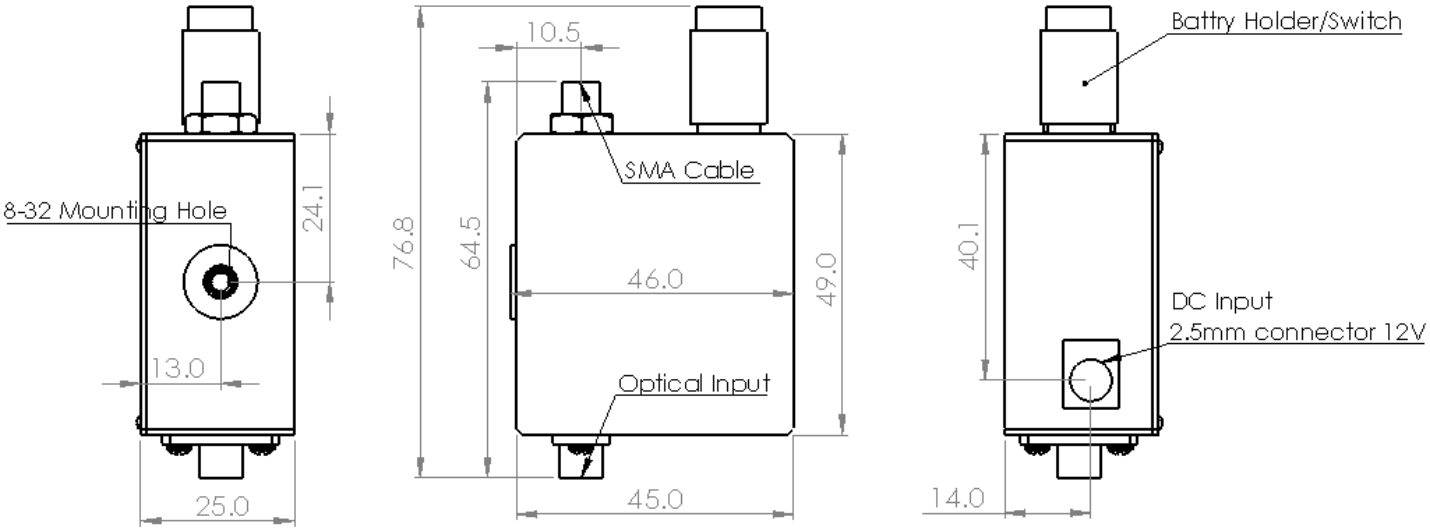
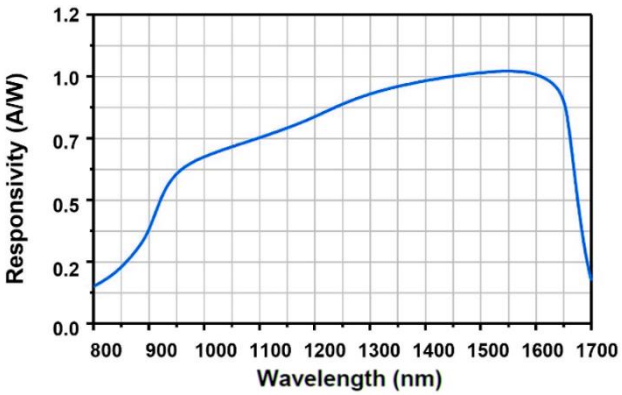
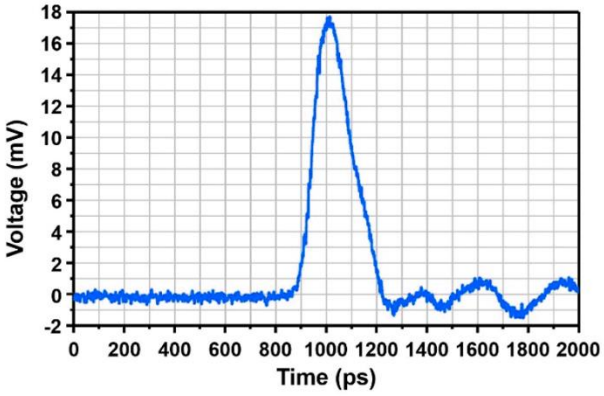
Mechanical Dimensions (mm)



Spectral Response (typical)



Pulse Response (typical)



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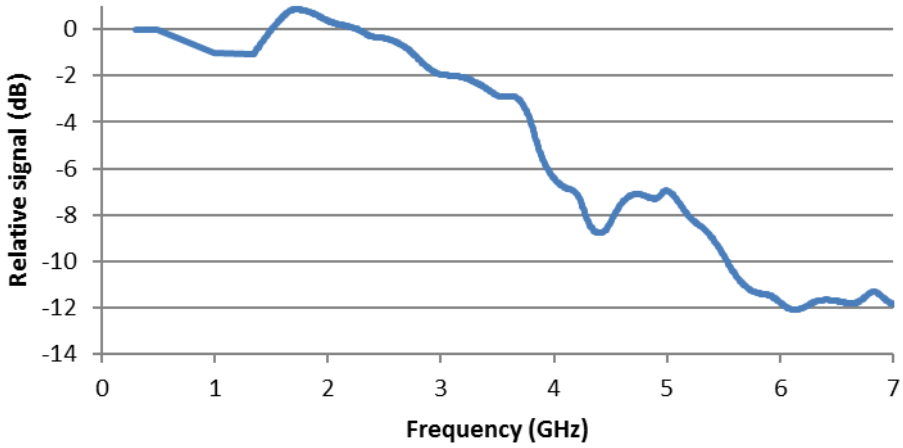
Frequency Response (typical)



Accessories

- 50 ohm Parallel Resistor
- Low Noise Wall Pluggable Power Supply
- A23 Battery

$25

$125

Included

Ordering Information

	F	☐	☐ ☐	☐	☐	☐	☐	☐
Prefix	**Type**	**Wavelength**	**Speed**	**Configure**	**Package**	**Grade***	**50 ohm**	**Power Supply**
HSDT-	Free-Space = F	800-1700nm = 1 Special = 0	4GHz =A4	Regular = 1 Special = 0	Regular = 1 Special = 0	Regular = 1 Premium = 2	Non = 1 Yes = 2	Non = 1 Yes = 2

***** Premium selects the sensitivity to exceed the listed value

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Operation Manual

- Connect the detector to an oscilloscope with an appropriate parallel resistor at the oscilloscope connection.
- Rotate the battery holder to open and load the battery, then close it.
- Push the back of the battery holder in to switch on
- Couple the optical input into the detector using an FC/PC cable
- The measured optical profile should be displayed on the oscilloscope
- For long operations, connect the DC power supply and push out the switch at the back of the battery holder.

Operation Physics

The photodiode consists of a PN junction that generates a photocurrent when light with energy (wavelength) matching the semiconductor's band gap illuminates in the region of the junction. In operation, a reverse external bias is applied to enhance the responsibility by increasing the width of the depletion junction and decreasing junction capacitance. The measured output current is linearly proportional to the input optical power. This type of directly biased photodiode is attractive for its fast response with little distortion. It is a challenge to produce high bandwidth photodetector with an amplifier that often distorts the true transit profile of a fast optical signal. Consequently, a biased photodetector without an amplifier is the choice for high-speed measurement. The bandwidth is inversely proportional to the active detector area. The bias voltage also generates a leakage current, called dark current, which increases with temperature. Dark current approximately doubles every 10 °C increase in temperature. Applying a higher bias will decrease the junction capacitance but will also increase the dark current.

Figure 1 illustrates the bias circuity inside the detector.