High-Speed Free-Space InGaAs Bias Detectors

4GHz, 800-1700nm

DATASHEET

BUY NOW

The HSDT series High-Speed Fiber-Coupled Detectors feature high fidelity response at high bandwidth >GHz, as well as large dynamic range. Biased detectors are the preferred method to measure a signal's fast transit characters, avoiding distortions caused by amplification circuitry. The HSDT free-space detectors produce a linear response to the incident light. Choices of flat detector window and ball lensed window are available. Being reverse-biased with an internal battery, the HSDT is operated in a photoconductive mode in which an input light generates a current flow. The high bandwidth signal is output through an SMA connector for monitoring with an oscilloscope or other measurement electronics. Since the signal is not amplified, a parallel resistor to the output that converts the detector current to an output voltage can maximize the response frequency. The smaller the parallel resistance at the output end is, the higher the peak power of the incident optical signal is required. The HSDT has a 100k parallel resistance built-in to reduce the background noise. For measurement <300MHz, no resistor is needed. For measurement >300MHz, a 50-ohm resistor is required to terminate parallelly at the oscilloscope input. To measure >500ns laser pulse, the detector output needs 1k-10k ohm resistance in parallel.

The HSDT detectors are designed for test or measurement applications, including research in the fields of data communications, analog microwaves, and general high-speed photonics. A wall-pluggable DC power supply is an available option.

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]			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 [4]		FC/PC		
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

[4]. Using FC/APC to input light may cause the artificial tail in the measurement profile

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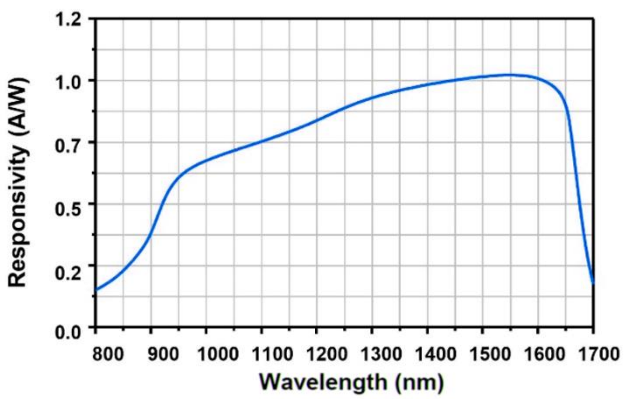
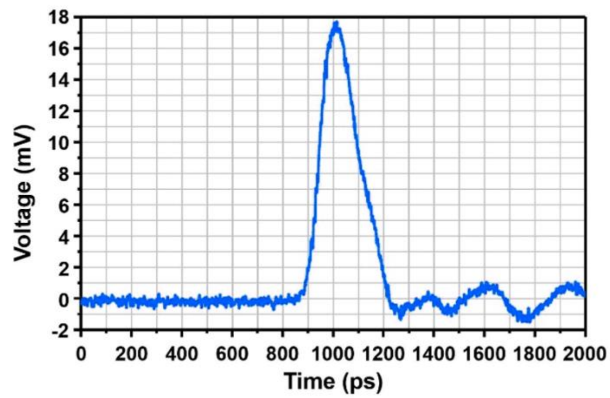
Mechanical Dimensions (mm)

Spectral Response (typical)



Pulse Response (typical)



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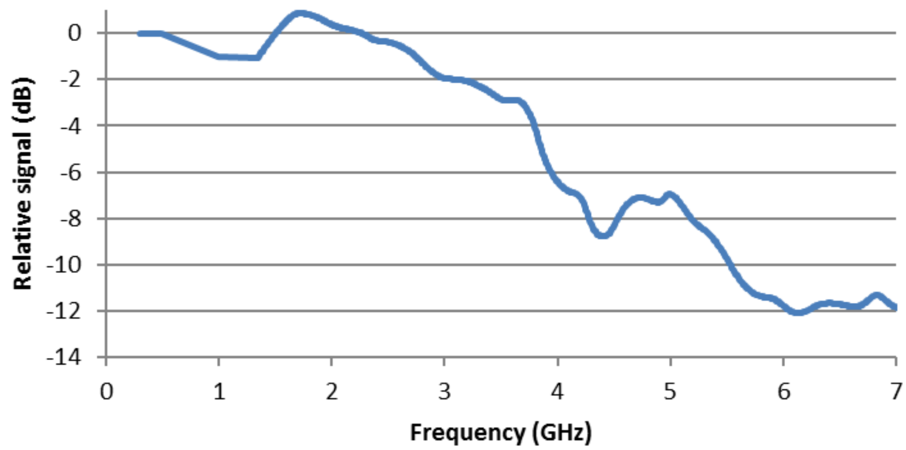
Frequency Response (typical)



Accessories

- 50 ohm Parallel Resistor

  $25

- Low Noise Wall Pluggable Power Supply

  $235

Ordering Information

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

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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.