High-Speed Fiber-Coupled InGaAs Bias Detectors

0-20GHz, 1300-1600nm

DATASHEET

BUY NOW

The HSDT series High-Speed Fiber-Coupled Detectors feature high fidelity analog response at high bandwidth up to 20GHz. Biased detectors are the preferred method to measure a signal's fast transit characters, avoiding distortions caused by amplification circuitry. The HSDT fiber-coupled detectors produce a linear response to the incident light. Being reverse-biased with an internal battery, the HSDT consists of a high-speed InGaAs PIN photodiode with an internal bias. It is operated in a photoconductive mode in which an input light generates a current flow. The high bandwidth signal is output through an RF 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
- Fiber Coupled
- Power Supplier Operation
- Battery Operation
- Fast Response

Applications

- General Lab Use
- Instruments

Specifications

Parameter	Min	Typical	Max	Unit
Wavelength Response	1300		1600	nm
Peak Response [1]		0.6	0.9	A/W
Bandwidth [2]	0		20	GHz
Optical Return Loss			40	dB
Dark Current		0.01	50	mA
PIN Bias		5	12	V
Optical Damage Threshold			50	mW
Output Impedance		50		W
RF Output Return Loss	8			dB
Operating Temperature	-40		50	°C
Optical Input		FC/APC		
Electric Output (DC Coupled)		SMA		
Battery	5V, 40mAh			

[1] DC Responsivity @1550nm/25°C
[2] Defined as the boundary at which the output is 3dB below the normal output

Rev 04/21/24

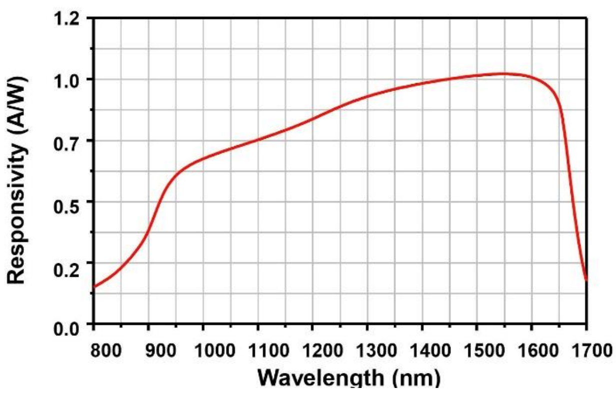
High-Speed Fiber-Coupled InGaAs Bias Detectors

0-20GHz, 1300-1600nm

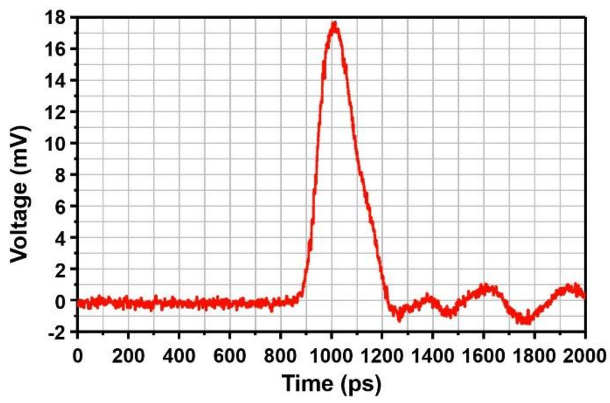
DATASHEET

Mechanical Dimensions (mm)

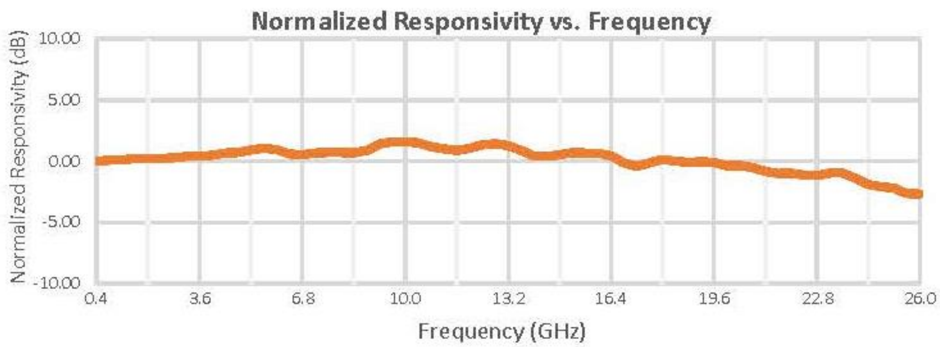
Spectral Response (typical)



Pulse Response (typical)



Frequency Response (typical)



High-Speed Fiber-Coupled InGaAs Bias Detectors

0-20GHz, 1300-1600nm

DATASHEET

Accessories

- 50 ohm Parallel Resistor

  $25

- Low Noise Wall Pluggable Power Supply

  $115

Ordering Information

	A	☐	20	☐	☐	☐	☐	☐
Prefix	**Type**	**Wavelength**	**Speed**	**Configure**	**Package**	**Optic Plate**	**50 ohm**	**Power Supply**
HSDT-		1310-1650nm = 1 Special = 0	20GHz = 20	Regular = 1 Special = 0	Regular = 1 Special = 0	Non = 1 Yes = 2	Non = 1 Yes = 2	Non = 1 Yes = 2

Application Notes

Fiber Core Alignment

Note that the minimum attenuation for these devices depends on excellent core-to-core alignment when the connectors are mated. This is crucial for shorter wavelengths with smaller fiber core diameters that can increase the loss of many decibels above the specification if they are not perfectly aligned. Different vendors' connectors may not mate well with each other, especially for angled APC.

Fiber Cleanliness

Fibers with smaller core diameters (<5 μm) must be kept extremely clean, contamination at fiber-fiber interfaces, combined with the high optical power density, can lead to significant optical damage. This type of damage usually requires re-polishing or replacement of the connector.

Maximum Optical Input Power

Due to their small fiber core diameters for short wavelength and high photon energies, the damage thresholds for device is substantially reduced than the common 1550nm fiber. To avoid damage to the exposed fiber end faces and internal components, the optical input power should never exceed 20 mW for wavelengths shorter 650nm. We produce a special version to increase the how handling by expanding the core side at the fiber ends.

High-Speed Fiber-Coupled InGaAs Bias Detectors

0-20GHz, 1300-1600nm

DATASHEET

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.