High-Speed Fiber-Coupled InGaAs Bias Detectors

25GHz, 500-1630 nm for SM Fiber, 850-1630 nm for MM Fiber, powered by battery or DC supply

DATASHEET

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The HSDT series of high-speed, fiber-coupled InGaAs PIN photodiode detectors delivers a highly linear, flat analog response in both amplitude and phase across a bandwidth up to 25 GHz, making it ideal for advanced frequency-domain, datacom, and microwave photonics testing. By operating in an unamplified photoconductive mode, these units capture ultra-fast signal transients via an RF SMA connector while completely avoiding the distortions introduced by active amplification circuitry. The detector features a built-in reverse-bias battery with an integrated twist switch, alongside an optional external DC power supply connector.

The unit features a built-in battery with a twist switch located at the battery holder's end. It also includes a connector for a DC power supply. An optional wall pluggable matching DC power supply is available.

Features

- Broadband Visible and IR Versions
- Single-mode or multimode FC fiber connectors
- DC to 25 GHz 3 dB bandwidth
- Internal microwave housing
- Smooth Frequency Response
- InGaAs Photodetectors for IR Wavelengths
- Internal Microwave Housing
- SM or MM fiber-optic Connectors

Applications

- Characterizing the frequency response of pulsed lasers, modulators and transmitters
- RIN measurements
- Microwave generation - heterodyne experiments

RoHS COMPLIANT

Specifications

Parameter		Min	Typical	Max	Unit
Device Type			Biased Detector		
Detector Material			InGaAs		
Detector Diameter			21		µm
Detector Type	SM Fiber		High-Speed Detector		
	MM Fiber		Schottky		
Wavelength Range	SM Fiber	500		1630	nm
	MM Fiber	850		1630	
3 dB Bandwidth				25	GHz
Maximum Conversion Gain	SM Fiber		17		V/W
	MM Fiber		11		
Responsivity	SM Fiber		0.7		A/W
	MM Fiber		0.6		
Optical Input			Fiber-optic		
Fiber-Optic Connector			FC/UPC		
Fiber Type			SM, 50 µm Multimode		
Rise Time			14		ps
NEP	SM Fiber		30		pW/√Hz
	MM Fiber		40		
Saturation Power			2		mW
Output Connector			Wiltron K		
Output Impedance			50		Ω
DC Bias Monitor Bandwidth			50		kHz
DC Bias Monitor Transimpedance Gain			1		V/mA
Power Requirements			Internal 9-V battery		
Operating Temperature		10		35	°C

Rev 05/22/26

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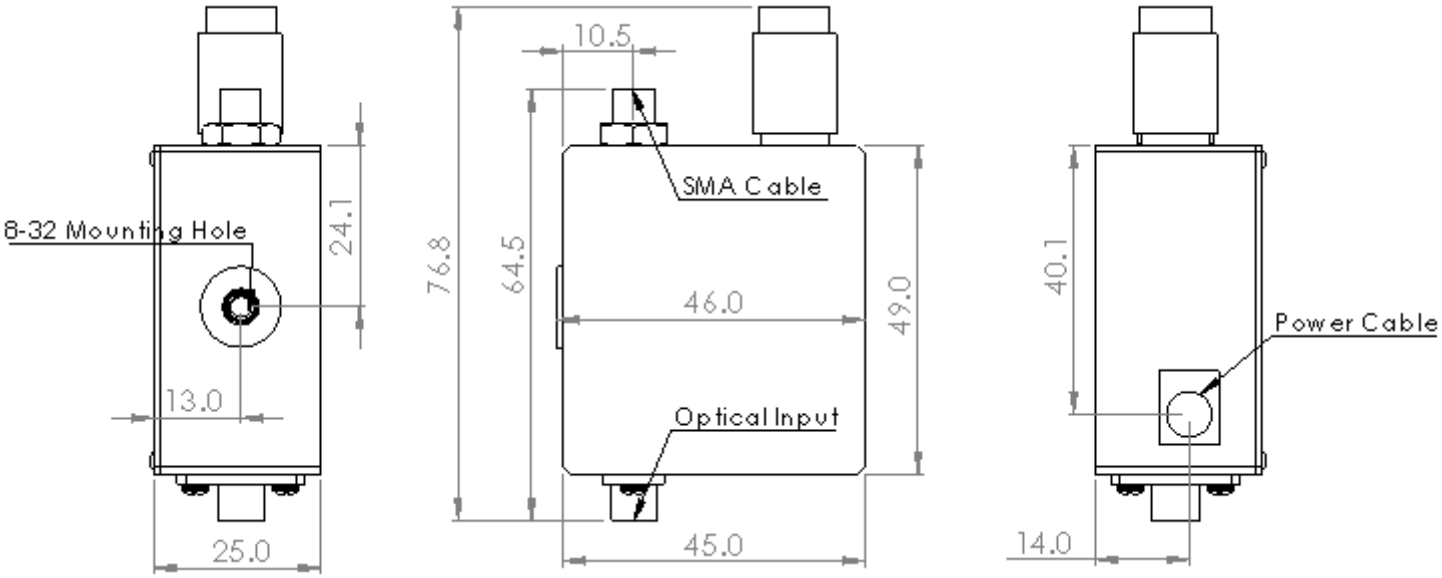
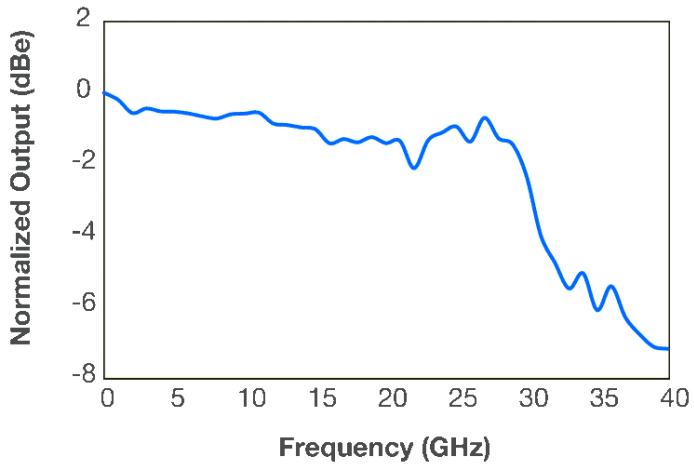
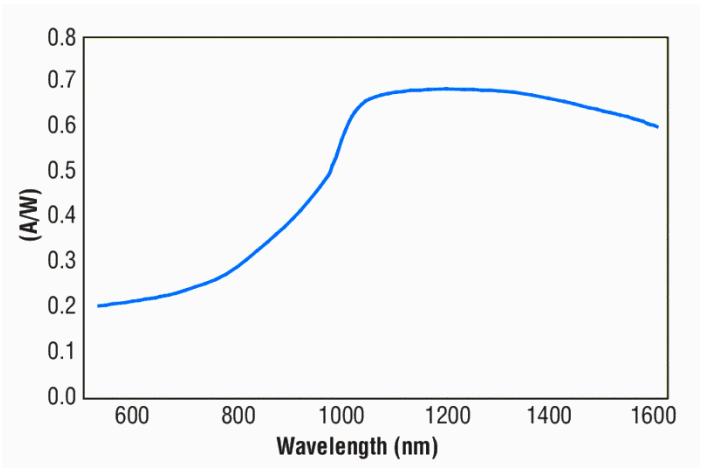
Mechanical Dimensions (mm)



*Product dimensions may change without notice. This is sometimes required for non-standard specifications.

Typical Responses





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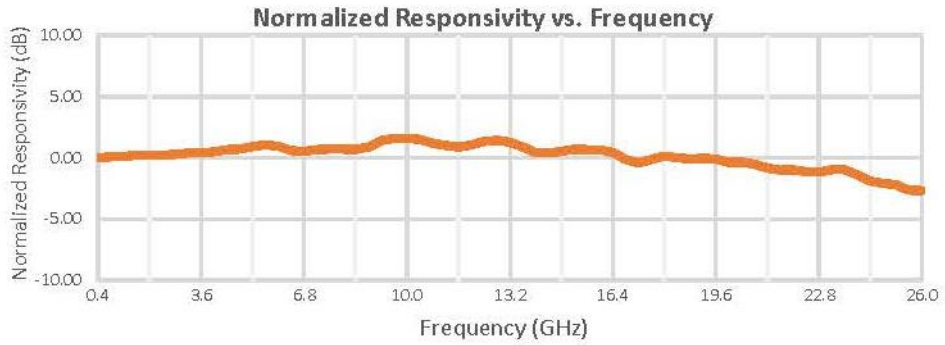
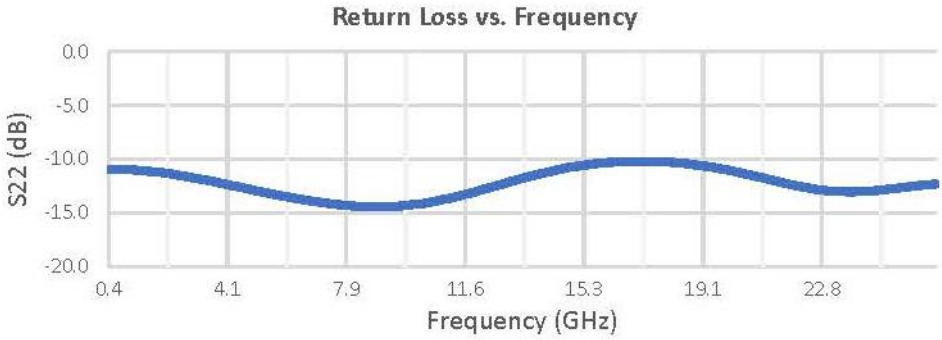
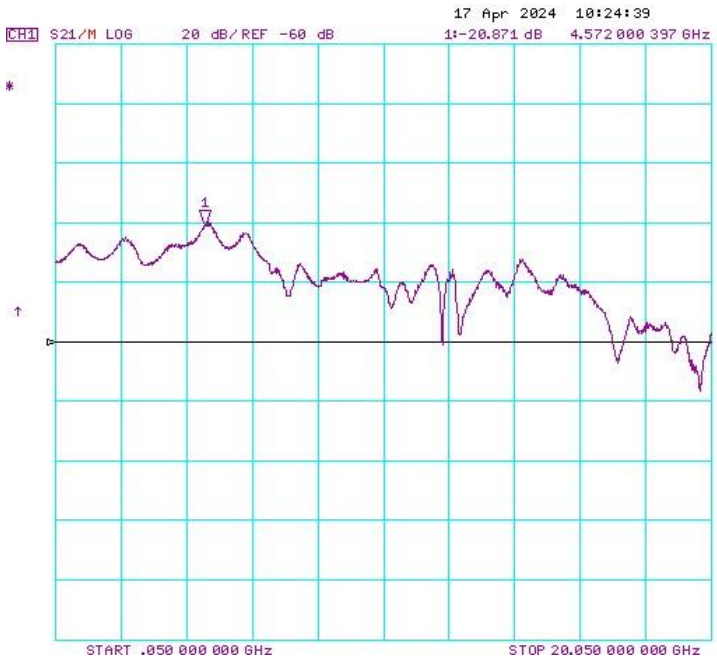
Frequency Response (typical)







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Accessories

- 50 ohm Parallel Resistor

$25

- Low Noise Wall Pluggable Power Supply

$115

Ordering Information (Part Number)

	A	☐	25	☐	☐	1	☐
Prefix	**Type**	**Wavelength**	**Speed**	**Configure**	**Package**		**Power Supply**
HSDT-		900-1630nm = 2 500-1630nm = 3	25GHz = 25	Regular = 1 Special = 0	Regular = 1 Special = 0		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.

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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.