High-Speed Fiber-Coupled InGaAs Bias Detectors

0-50GHz, 1000-1600nm

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The HSDT series High-Speed Fiber-Coupled Detectors are plug-and-play units featuring high-fidelity analog response with bandwidths up to 50 GHz. These biased detectors are ideal for measuring fast signal transients without distortion from amplification circuitry. Each unit integrates a high-speed InGaAs PIN photodiode operated in photoconductive mode with an internal reverse bias, providing a linear optical-to-electrical response without ringing and supporting input powers up to 10 dBm. The output is delivered via an RF SMA connector. Designed for high-speed photonics applications, HSDT detectors are suited for test and measurement tasks in data communications, analog microwave systems, and general photonic research.

Features

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

Specifications

Parameter	Min	Typical	Max	Unit
Wavelength Response	1300		1600	nm
Peak Responsivity @DC		0.4		A/W
Bandwidth @3dB S21	0		50	GHz
Output Reflection Coefficient S22	-6			dB
Dark Current		5		nA
PIN Bias		2.8		V
Optical Damage Threshold			10	dBm
Output Impedance		50		Om
Operating Temperature	-40		50	°C
Optical Input		FC/APC		
Electric Output (DC Coupled)		SMA		

Applications

- Microwave Photonics
- Instruments

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Ordering Information

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Prefix	**Type**	**Wavelength**	**Speed**	**Configure**	**Package**		**Power Supply**
HSDT-		1310-1650nm = 1 Special = 0	50GHz = 050	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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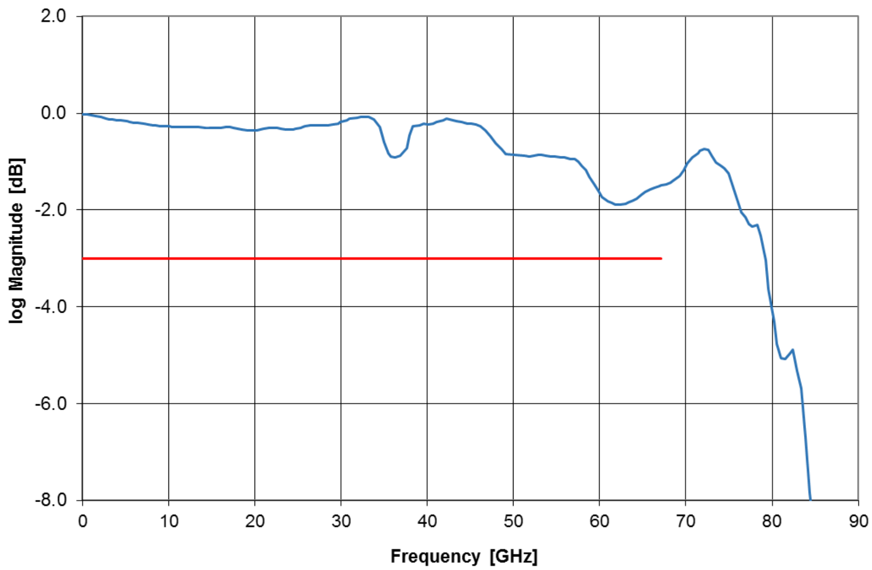
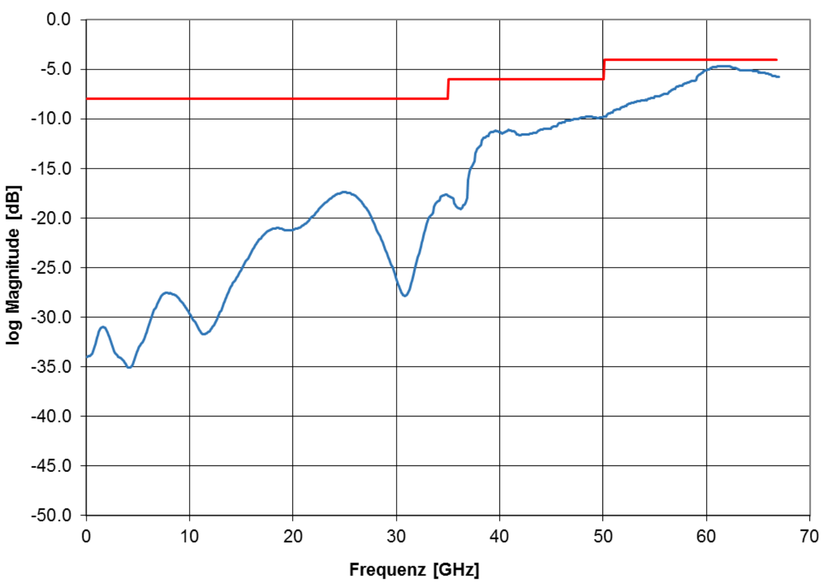
Frequency Response (typical)

S21



S22



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Operation Manual

- Connect the RF SMA to an instrument.
- Connect the optical input to the Unit
- Plug the accompanied wall pluggable DC power supply
- The measured optical profile should be displayed on the instrument.

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.