DXM21AF: 21 GHz Photodetector Instrument

Features

- DC - 21 GHz Bandwidth
- 780 - 1650 nm Sensitivity
- 20 ps Impulse Response
- SMF-28 Input Fiber
- 2.92 mm Coaxial Output Connector
- 50 Ω Reverse Termination

Applications

- Test and Measurement
- High-Speed Communications
- Microwave Photonics



DXM21AF

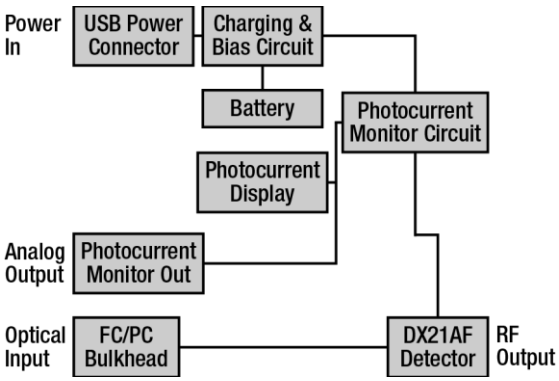
Description of Models

The DXM21AF Photodetector Instrument has a 21 GHz bandwidth and uses an InGaAs-based photodetector for applications primarily in the 780 to 1650 nm wavelength range. The core element of the DXM21AF is the fiber-coupled, hermetically sealed microwave detector module. The DXM21AF module is supplied with an SM fiber optic input with an FC/PC input connector (Narrow Key, 2.0 mm). Signal output is provided via a field-replaceable, female, 2.92 mm RF connector, which may be connected to a measurement instrument with suitable adapters or cables. An SMA jack on the input panel provides the DC analog output of the current monitor signal. Included with each DXM21AF unit is a USB-style power adapter for charging the battery and a mounting bracket (ECM100) that snaps onto the side of the housing. The ECM100 bracket has a #8 (M4) counterbore, which allows easy mounting to any object with an 8-32 (M4) threaded hole. Order by the following model numbers:

- **DXM21AF** Single Mode Ultrafast Detector with Current Monitor, 780 - 1650 nm, DC - 21 GHz, FC/PC

A version with FC/APC connectors is available upon request by contacting techsales@thorlabs.com (Item # DXM21AA). Specifications are identical to the FC/PC version.

Block Diagram



Operating Conditions

Parameter	Min	Typical	Max	Unit	Note
Operating Temperature	10	-	40	°C	-
Storage Temperature	0	-	50	°C	-
Relative Humidity	-	-	85	%	Non-Condensing
Optical Input Power, Average	-	-	10	dBm	Absolute Maximum
Optical Input Power, Peak	-	-	13	dBm	Absolute Maximum, 50% Duty Cycle

O-E Specifications

All specifications are at 25 °C and at 1550 nm unless noted.

Parameter	Min	Typical	Max	Unit	Note
Wavelength Range	780	-	1650	nm	See Performance Graphs for Full Spectral Response
-3 dB Bandwidth	-	21	-	GHz	-
Low Frequency Cutoff	-	DC	-	-	-
Impulse Response	-	20	-	ps	FWHM at 1560 nm
Impulse Undershoot		<15		%	At 1560 nm
Responsivity	-	0.9	-	A/W	-
Conversion Gain	-	22.5	-	V/W	Across External 50 Ω Load
Noise-Equivalent Power (NEP)	-	28	-	pW/√Hz	The NEP is limited by the thermal noise of the combined internal and external load resistors (25 Ω).
Optical Return Loss	-	-	-25	dB	-
Dark Current	-	-	50	nA	-
Reverse Termination Impedance	45	50	55	Ω	RF Output
Electrical Return Loss	-	-10	-	dB	To 10 GHz
		-4.5		dB	To 21 GHz

Additional Specifications

DC Current Monitor	
Output Accuracy	±3%
Analog Output[a] Transimpedance Gain	200 mV / mA
Analog Output[a]	3.5 V (Max Linear)
Analog Output[a] Impedance	High-Z
Digital Display Output (Max)	20 mA
Digital Display Output Resolution	1 nA
Power Supply	
Power Supply[b,c]	+5 VDC, Mini-USB Connector (Max Current 500 mA)
Battery Capacity	500 mAh
Battery Charging Time[c]	2 h (Typical for Full Charge)

a. Voltage Output via SMA Connector

b. Input Voltage Range as Specified by USB Standards

c. Specifies the time to charge when the included power supply is used. USB chargers for phones, tablets, or similar products may be used and will charge the battery at a maximum rate of 500 mA. Non-dedicated charging USB ports (e.g. those on a PC) will charge at a lower 100 mA rate.

MECHANICAL SPECIFICATIONS

Parameter	Value
Fiber Connector	2.0 mm Narrow Key FC/PC
Internal Fiber Type	SMF-28
Unit Dimensions	88.6 mm x 61.4 mm x 29.6 mm
RF Output Connector	Female 2.92 mm, 50 Ω, Field Replaceable; 8 in·lb Torque Spec.
Current Monitor Connector	Female SMA; 5 in·lb Torque Spec.

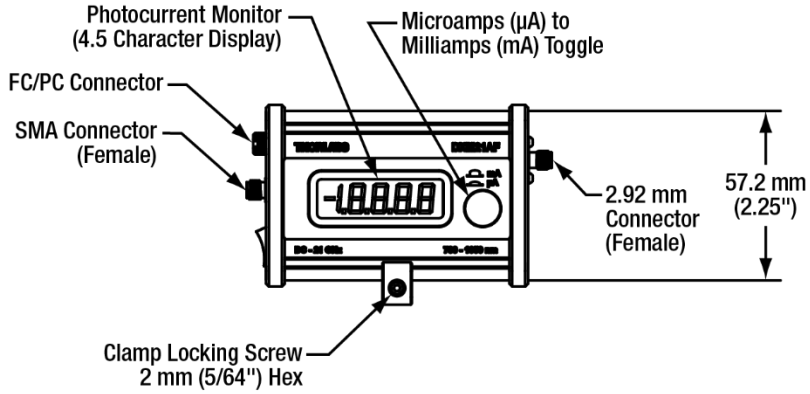


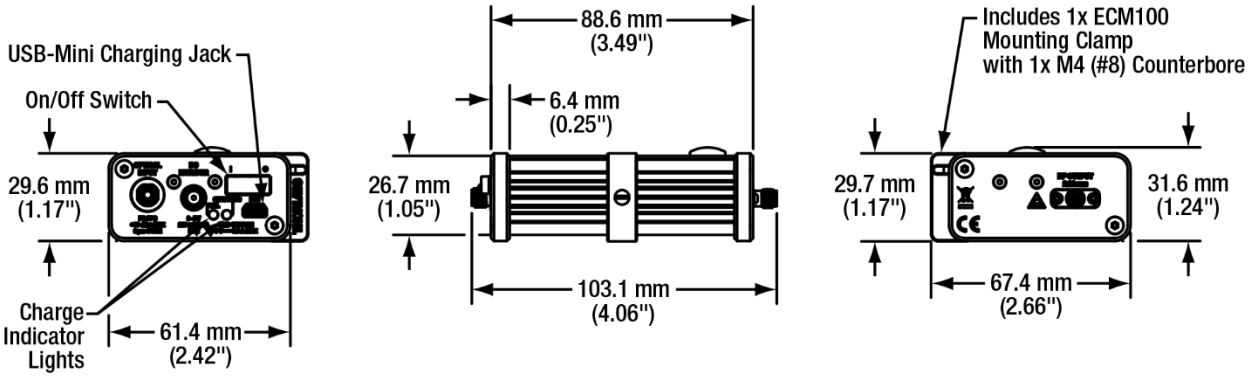
DXM21AF Optical Input Panel



DXM21AF RF Output Panel

MECHANICAL DRAWING







Be sure to observe all ESD precautions. The components inside this instrument are ESD sensitive. Take all appropriate measures to discharge personnel and equipment before making any electrical connections to the unit. This also applies to coaxial cables that easily accumulate capacitive charge.

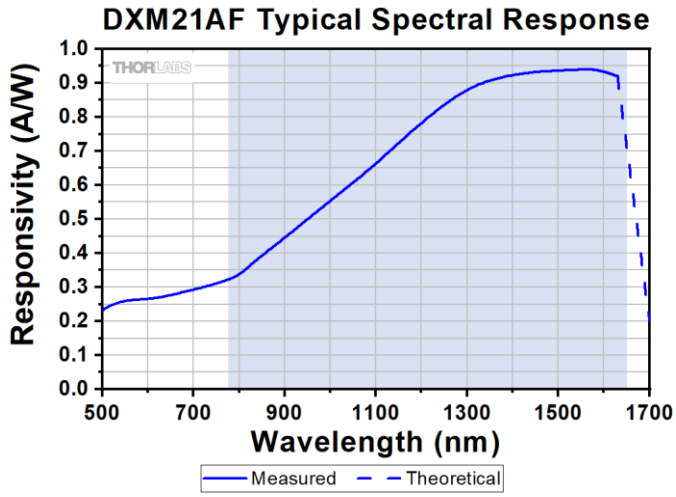
Operational Sequence

1. Make sure the device is mounted firmly as desired and the RF output is connected. Do not over-torque the RF connector. Thorlabs offers an 8 in·lb, 5/16" hex torque wrench suitable for securing this connection.
2. Connect the USB power cable and switch the unit ON.
3. Couple the optical input signal to the unit via the FC connector.
   NOTE: Be sure to not exceed the maximum optical input power rating.
4. To power down, remove the optical input first, then turn the switch OFF.

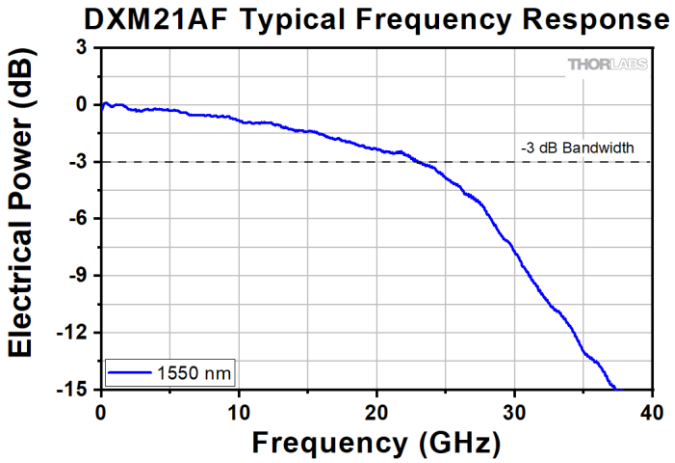
Additional Considerations

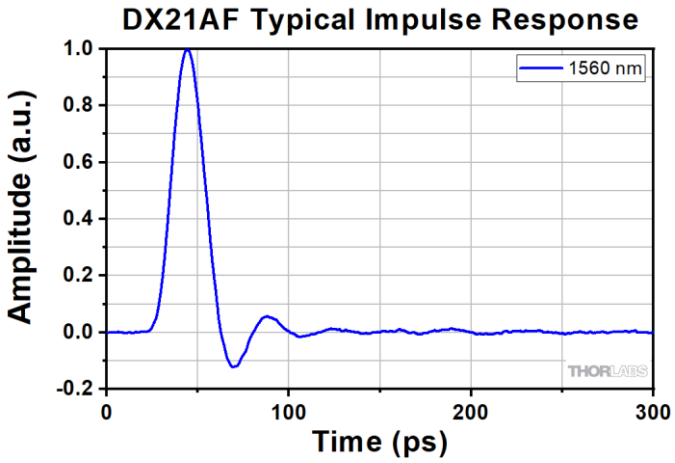
- **Optical Input Connector**: Clean the FC input connector before every connection. This is the number one source of reduced sensitivity. Keep the FC connector capped when not in use. Input fiber for single-mode detectors should be SMF-28 or equivalent. Input fiber for multimode detectors should be OM4 or SMF-28, or equivalent. Ensure the average input optical power does not exceed the absolute maximum of 10 dBm.
- **DC Photocurrent Monitor:** The Monitor Output provides a DC signal level that is proportional to the photocurrent. Use any standard, high-impedance voltmeter to measure this voltage.
- **External Cleaning:** Use a soft cloth moistened with mild glass cleaner. Do not spray directly onto the unit.

Typical Performance Graphs

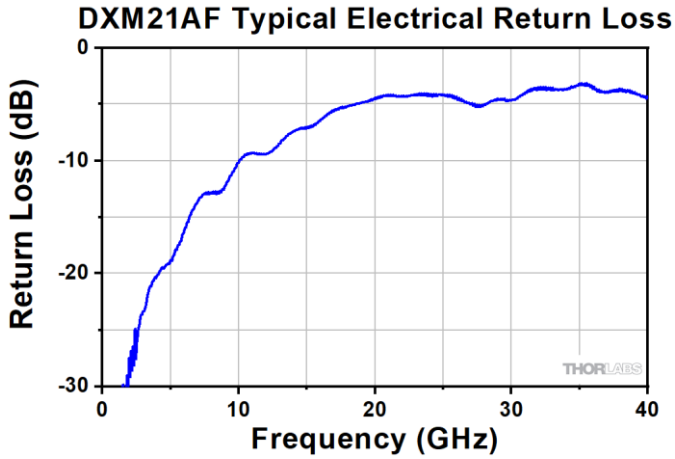


The blue-shaded region indicates the wavelength range.





Pulse measured on a 70 GHz sampling scope.
Scope response not deconvolved.



PRECAUTIONS



The components inside this module are ESD sensitive. Take all appropriate precautions to discharge personnel and equipment before making any electrical connections to the unit. This also applies to coaxial cables that easily accumulate capacitive charge.

General: All statements regarding safe operation and technical data in this user guide will only apply when the unit is operated correctly. Additional support documentation for this particular product is available at www.thorlabs.com.

Applying Power: Each DXM21AF unit is supplied with an external, USB-style, +5 V power adapter for the purpose of charging the internal battery. The instrument must only be operated with a duly shielded and low resistance USB cable delivered by Thorlabs. Observe the LED indicators on the input panel for charging status.

Covers and Service: Do not remove the cover of the DXM21AF detector. There are no user serviceable parts in these products. If service is required, please contact Thorlabs Tech Support.

Explosive Environments: Do not operate this device in explosive environments

Shielded Connections: Connection cables attached to the RF output and SMA monitor ports of the DXM21AF units must be properly shielded.

Electromagnetic Interference: Mobile telephones, cellular phones or other radio transmitters are not to be used within the range of 3 meters of this unit since the electromagnetic field intensity may then exceed the maximum allowed disturbance values according to IEC 61326-1. This product has been tested and found to comply with the limits according to IEC 61326-1 for using connection cables shorter than 3 meters (9.8 feet). This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules and meets all requirements of the Canadian Interference-Causing Equipment Standard ICES-003 for digital apparatus.

Thorlabs GmbH is not responsible for any radio television interference caused by modifications of this equipment or the substitution or attachment of connecting cables and equipment other than those specified by Thorlabs GmbH. The correction of interference caused by such unauthorized modification, substitution or attachment will be the responsibility of the user.

MANUFACTURING AND COMPLIANCE

Manufactured by: Thorlabs Inc., Ann Arbor, MI 48103 USA

All specifications are subject to change without notice.

