BDXQ1 Series High Quantum Efficiency Balanced Photodetectors

Features

- 1.2 A/W Responsivity at 1550 nm
- DC - 3 GHz Bandwidth
- 120 ps Impulse Response
- SMF-28e Fibers
- Surface Mount Package
- Low Crosstalk of <40 dB
- High Common Mode Rejection Ratio of >20 dB
- Very Low Artifacts/Reflections
- Fibers Matched in Length to 1 mm
- 10.0 x 12.0 mm Footprint



BDXQ1F

Applications

- Quantum Detection Systems
- OEM Balanced Detection
- OCT Systems



Close-Up View of the BDXQ1A Surface Mount Package

Description of Models

The BDXQ1 series of high-speed, InGaAs, balanced detectors are designed for high quantum efficiency (HQE) applications in the 1550 nm wavelength range. They achieve 3 GHz of bandwidth with 1.2 A/W responsivity and 97% quantum efficiency. The surface mount package comes with two 0.5 m loose-tube buffered SMF-28e input fibers and FC/PC or FC/APC connectors. LC/PC connectors are also available upon request. The module is designed to be an optical daughter board with all connections made by soldering the half-vias around the perimeter. The optical design provides for very low reflections and signal artifacts. Signal output is provided through a GSG arrangement of the output connections.

The BDX1EVB evaluation board is also available for soldering a BDX family detector in place so that power and output connections can be made with common cables and connectors.

- **BDXQ1A** 3 GHz HQE Module, SMF-28e Input Fibers, Ø900 µm Buffer, FC/APC Connectors
- **BDXQ1F** 3 GHz HQE Module, SMF-28e Input Fibers, Ø900 µm Buffer, FC/PC Connectors
- **BDX1EVB** Evaluation Board for BDX Family Detectors

Absolute Maximum Ratings

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

Parameter	Min	Typ.	Max	Unit	Note
Optical Input Power, Avg.	-	-	10	dBm	-
Photodiode Bias Voltage	-	-	15	V	Positive for PD+, Negative for PD-
Fiber Bend Radius	15	-	-	mm	Breakage

Operating Conditions

Parameter	Min	Typ.	Max	Unit	Note
Operating Temperature	10	-	40	°C	-
Storage Temperature	0	-	50	°C	-
Relative Humidity	-	-	50%	-	Non-Condensing
Photodiode Bias Voltage	+10	+12	+15	V	Positive for PD+, Negative for PD-

Specifications

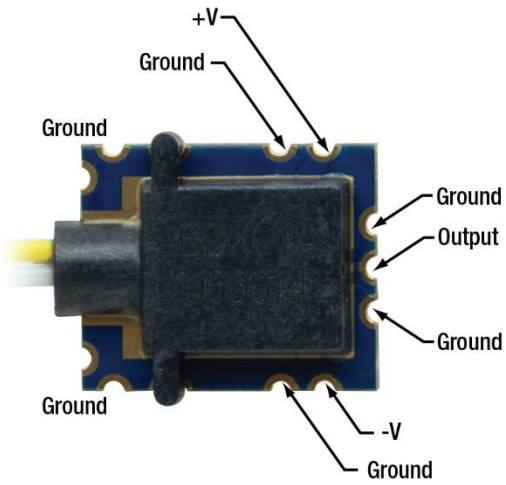
All specifications are typical at 25 °C, 12 V bias, and 1550 nm unless noted. Best performance is obtained when input powers are balanced. Fiber connecter alignment can introduce imbalance in the input powers.

Parameter	Min	Typ.	Max	Unit	Note
Wavelength Range	1525	1550	1575	nm	-
-3 dB Bandwidth	2	3	-	GHz	At 1560 nm
Low Frequency Cutoff	-	DC	-	-	-
Impulse Response	-	120	-	ps	FWHM at 1560 nm
Responsivity	1.1	1.2	-	A/W	At 1550 nm (Depends on Connector Alignment)
Responsivity Matching	-	-	5%	-	Depends on Connector Alignment
Quantum Efficiency	-	97%	-	-	At 1550 nm (Depends on Connector Alignment)
Polarization Dependent Responsivity	-	0.1	-	dB	-
Linearity (Deviation)	-	1%	-	-	Up to +10 dBm (See Linearity Plot)
Optical Return Loss	-	-45	-40	dB	Each Fiber
Crosstalk	-	-	-40	dB	Between Detectors
Common Mode Rejection Ratio	-	>20	-	dB	Depends on Fiber Length Matching and Power Balancing
Dark Current	-	< 20	50	nA	Each PD
Photodiode Diameter	-	120	-	µm	-
Capacitance (per PD)	-	1	-	pF	Each PD

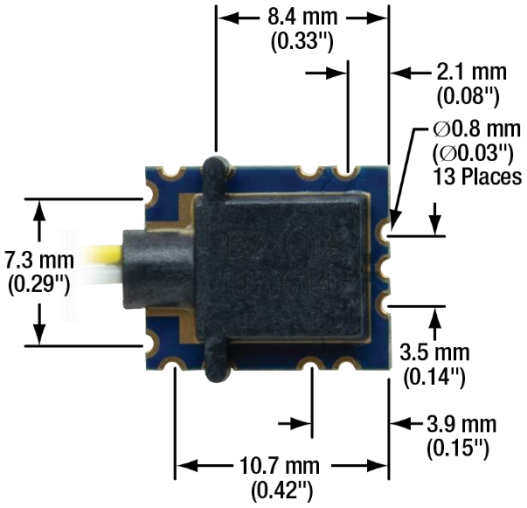
MECHANICAL & PIN OUT

Parameter	Value
Fiber Connector	FC/APC or FC/PC
Fiber Type	SMF-28e
Mode Field Diameter	10.4 ± 0.5 µm @ 1550 nm
Fiber Length & Match	50 cm ± 10 cm; Length Matched to < 1 mm (With Connectors)
Fiber Buffer	Ø900 µm Loose Tube, Yellow on PD+, White on PD-
RF Output Connector	Solderable Half-Vias in GSG Configuration
Soldering[a]	Max 5 s at 250 °C Per Location

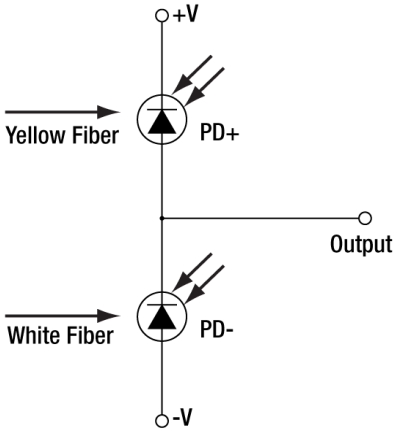
a. All soldering must be done by hand; a reflow oven will damage the device.



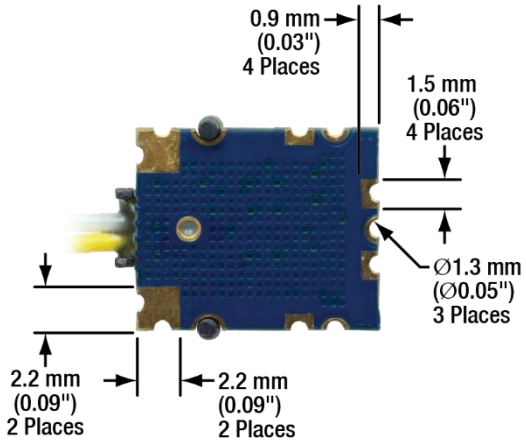
Electrical Pin Out



Soldering Pad Locations

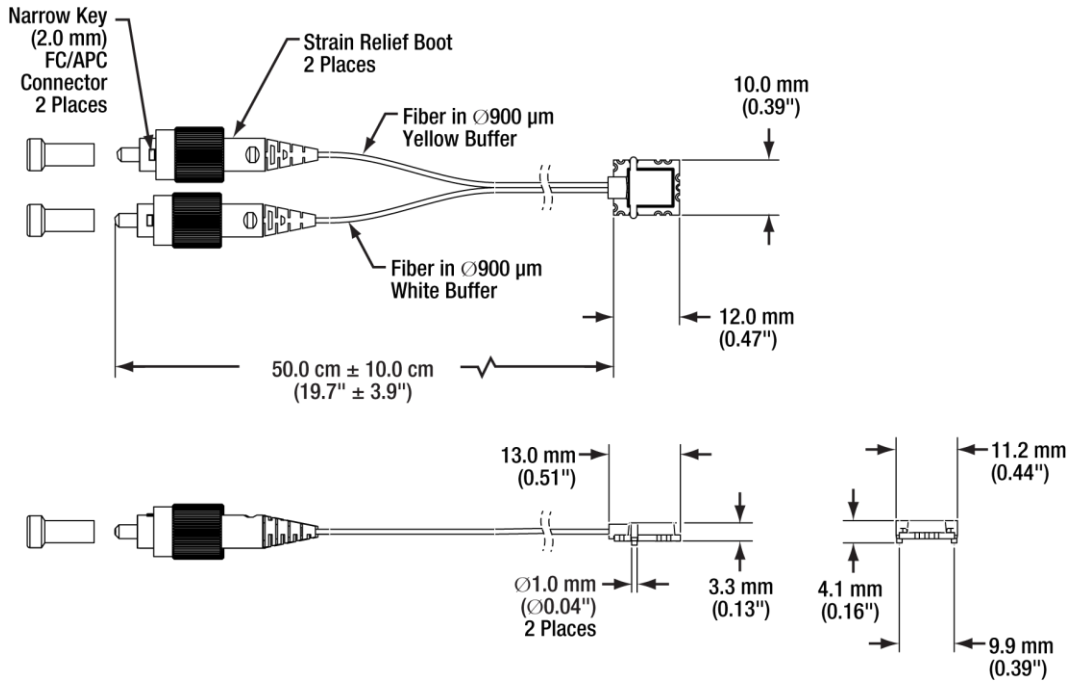


Internal Electrical Configuration

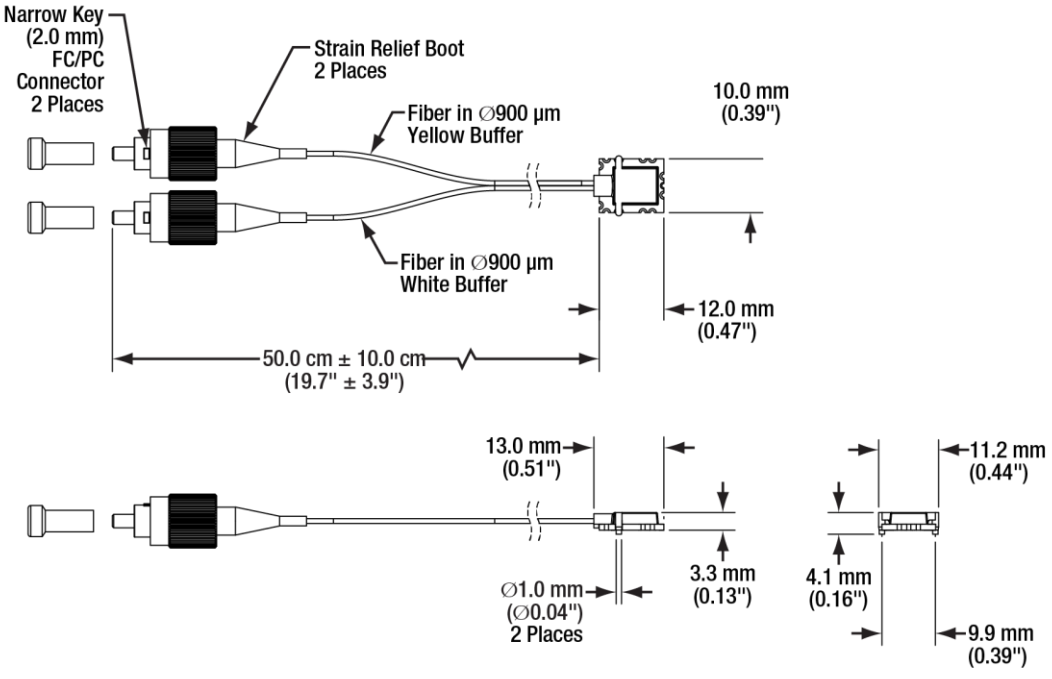


Soldering Pad Dimensions

MECHANICAL DRAWINGS



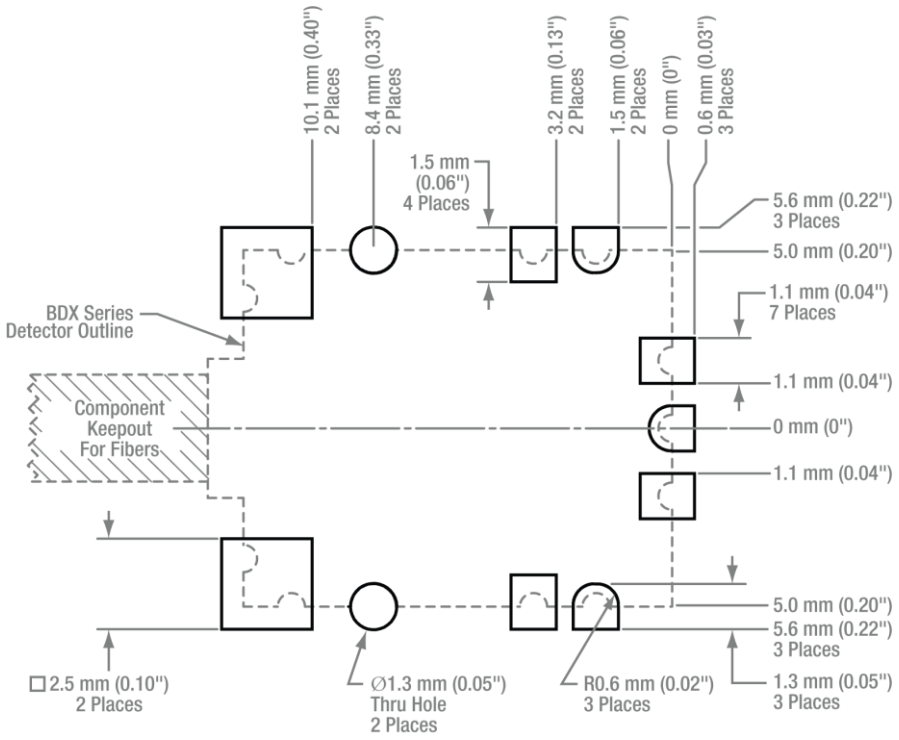
Drawing of a BDXQ1A Detector



Drawing of a BDXQ1F Detector

LAND PATTERN AND PCB GEOMETRY

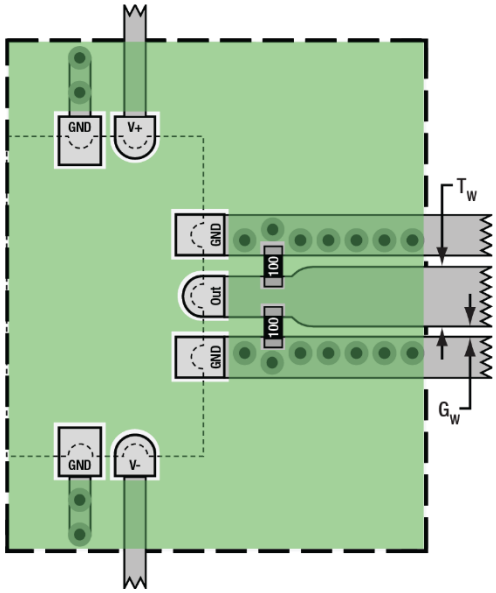
The surface mount packaging of the BDX family of detectors makes them well-suited for incorporation into PCB assemblies. This section provides guidelines on PCB geometry.



Output Interface Example: 50 Ω Grounded Coplanar Waveguide

Top Metal: Signal
Bottom Metal: Ground

Controlled Impedance Dimensions:
- Trace Width (T_W): 70.0 mil (1.778 mm)
- Gap Width (G_W): 10.9 mil (0.277 mm)

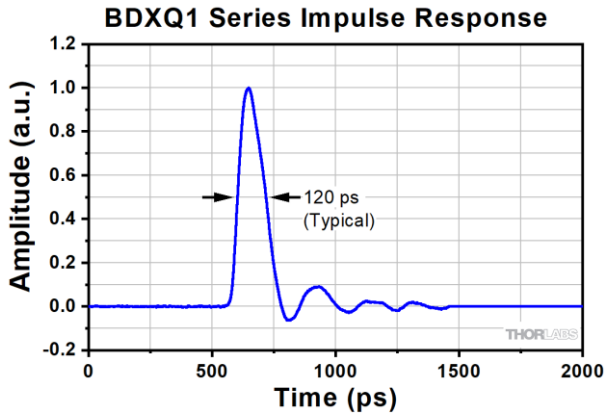


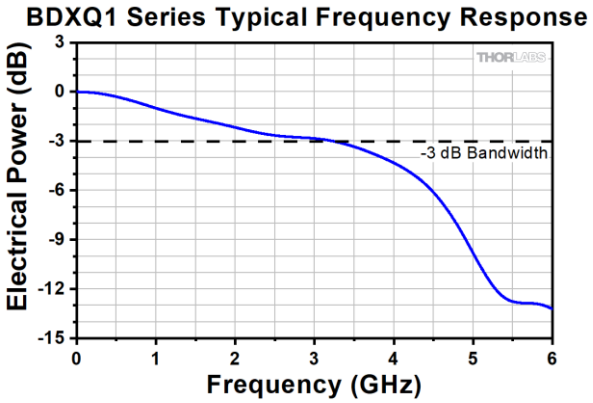
Layer	Material	Thickness	Relative Permittivity
Top Solder Mask	Solder Resist	0.40 mil (10.2 µm)	3.5
Top Metal	-	1.40 mil (35.6 µm)	-
Dielectric	FR-4	58.4 mil (1.48 mm)	4.3
Bottom Metal	-	1.40 mil (35.6 µm)	-
Bottom Solder Mask	Solder Resist	0.40 mil (10.2 µm)	3.5

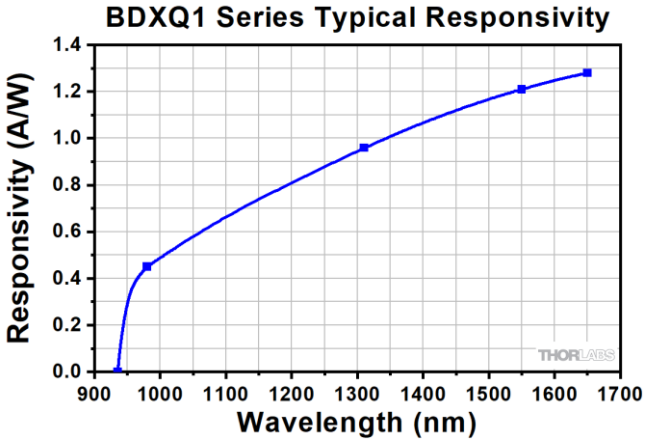
Note: Consult with you PCB vendor for recommended controlled impedance trace width and spacing consistent with the layer stack of your design.

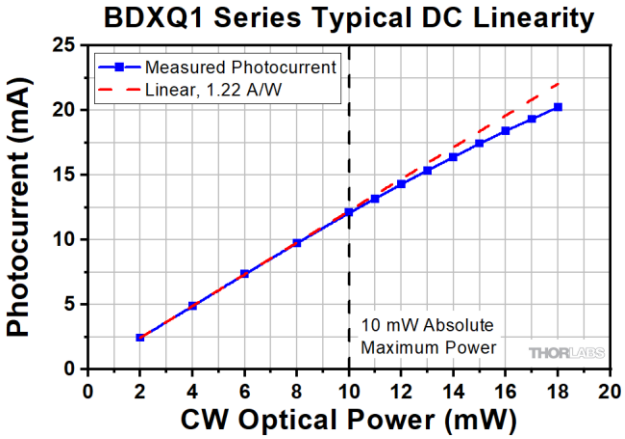
Typical Performance Graphs

The graphs below demonstrate the typical performance of a BDXQ1 series detector with a 100 fs input pulse. This data was collected with a BDXQ1x detector soldered to the BDX1EVB evaluation board with resistor locations R5 and R6 unpopulated, i.e. without back termination. Responsivity was measured at five discrete wavelengths as shown.









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 change.

Manufacturing and Compliance

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

