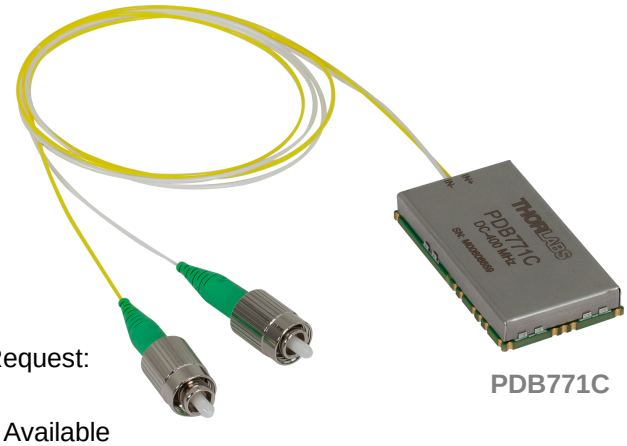
PDB771C: OEM Balanced Amplified Detector



PDB771C

FEATURES

- Complete Balanced Detector Module on PCB for Flexible Integration
- Small Size: 45.0 mm x 25.0 mm x 7.0 mm (1.77" x 0.99" x 0.28")
- 50 cm Input Fiber with FC/APC Connectors and Well-Matched Lengths
- Customized Specifications Available Upon Request: Bandwidth, Gain, Fiber Length, Connector
- Ready-to-Use Evaluation Board PDBEVAL1 Available

APPLICATIONS

- OEM Applications Requiring Balanced Amplified Detection
- LIDAR
- OCT
- Optical Time Domain Reflectometry (OTDR)

DESCRIPTION OF MODEL

The PDB771C is a small high-speed, InGaAs balanced amplified photodetector mounted on a PCB for integration in systems.

It consists of two length-matched 50 cm fibers with FC/APC connectors that direct the signal to fiber-coupled photodiodes. An ultra-low noise, ultra-low distortion high-speed transimpedance amplifier generates an output voltage (RF OUTPUT) at bandwidth of DC to 400 MHz. The output voltage is proportional to the difference between the photocurrent in the two photodiodes, i.e. the two optical input signals. Additionally, the unit has two monitor outputs (MONITOR+ and MONITOR-) to measure the individual optical input power level as well as low frequency (up to 150 kHz) modulated signals. The PDB771C is best suited for applications in the 980 - 1625 nm wavelength range.

For flexible integration, the PDB771C can be soldered to a custom PCB designed for the PDB771C for signal export and mounting. Please find detailed instructions under System Integration and Mounting. All PDB77xC balanced photodetectors carry the same layout.

Alternatively, Thorlabs offers a PDB evaluation board PDBEVAL1, which provides a PCB layout matching all PDB77xC detectors. This evaluation board supplies power via a Thorlabs LDS12B power supply (not included) and signal output via SMA connectors.

Customized versions for different bandwidths or with different connectors are available upon request.

- **PDB771C** Complete Balanced Amplified Photodetector for OEM System Integration; Wavelength Range: 980 nm to 1625 nm

ABSOLUTE MAXIMUM RATING

All specifications are valid at 23 ± 5 °C and 45 ± 15% rel. humidity (non-condensing)

Parameter	
Photodiode Damage Threshold	10 mW

OPERATING CONDITIONS

All technical data are valid at 23 ± 5 °C and 45 ± 15% rel. humidity (non-condensing).

Parameter	
Operating Wavelength	980 - 1625 nm; Optimized for 1060 nm
Operating Voltage	±9 V to ±12 V
Quiescent Current	±50 mA
Full Load Current	±150 mA
Operating Temperature Range	0 - 40 °C
Storage Temperature Range	0 - 50 °C

SPECIFICATIONS

All technical data are valid at 23 ± 5 °C and 45 ± 15% rel. humidity (non-condensing).

Parameter	
Coupling Loss	<0.5 dB (Max) <0.3 dB (Typ.)
Typical Max Responsivity	0.70 A/W @ 1050 nm
RF Output	
RF OUTPUT Bandwidth (3 dB)	DC - 400 MHz
Common Mode Rejection Ratio	Min >25 dB
RF OUTPUT Transimpedance Gain[a]	10 x 10^3 V/A
RF OUTPUT Conversion Gain[a]	7.0 x 10^3 V/W @ 1050 nm
RF OUTPUT CW Saturation Power	540 µW @ 1050 nm
Minimum NEP[b]	10 pW/√Hz (DC to 100 MHz) @1050 nm
RF Output Voltage Swing	±3.8 V (High Z) ±1.9 V (50 Ω)
Overall Output Voltage Noise	<2.6 mV_{RMS}
DC Offset	< ±2 mV
MONITOR Outputs	
MONITOR Output Impedance	200 Ω
MONITOR Output Bandwidth (3 dB)	DC - 150 kHz
MONITOR Output Conversion Gain, High Z Load[a]	7.0 V/mW @ 1050 nm
MONITOR Output Voltage Swing, High Z Load	10 V Max
Overall Output Voltage Noise	<0.65 mV_{RMS}
DC Offset	<±2 mV

[a]) Values do not consider losses introduced by the FC/APC connectors (typically 0.15 to 0.35 dB). Values are given for high-impedance load. For a 50 Ω load, divide the value by 2.

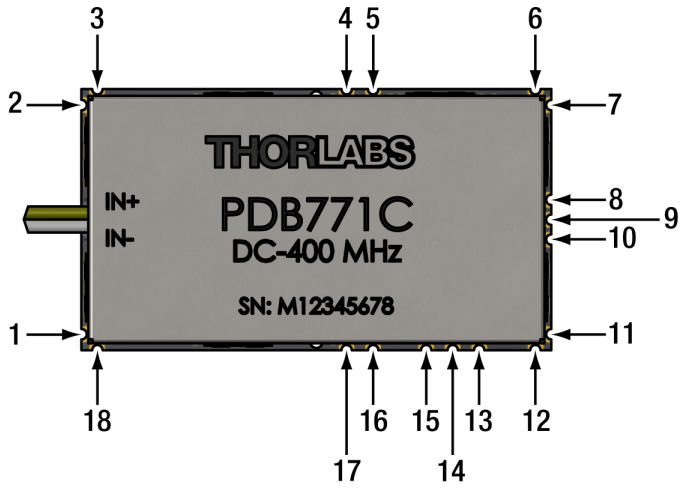
[b]) For more information on NEP, please see Thorlabs' Noise Equivalent Power White Paper.

MECHANICAL SPECIFICATIONS

All technical data are valid at 23 ± 5 °C and 45 ± 15% rel. humidity (non-condensing)

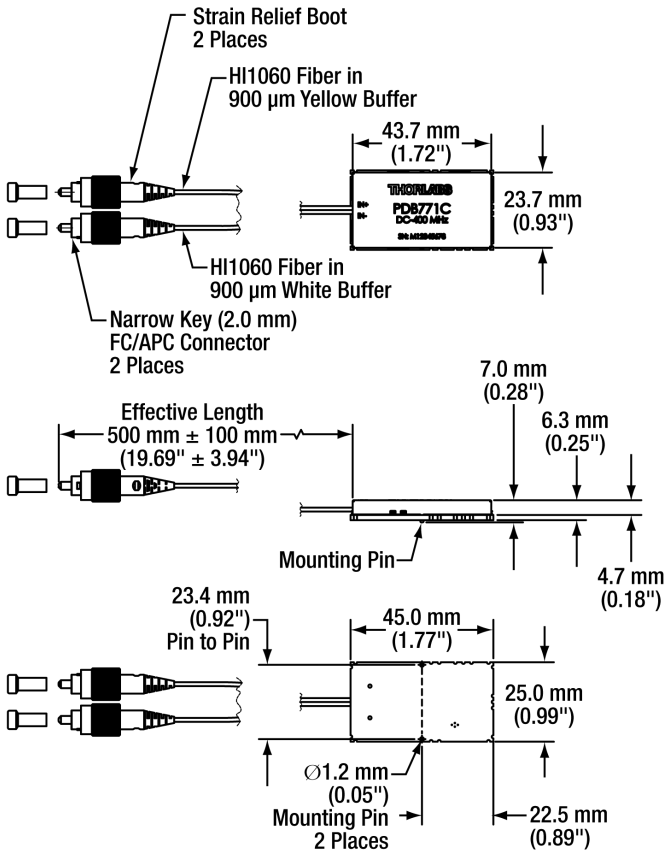
Parameter	
Detector Type	InGaAs
Optical Input Connector	2.0 mm Narrow Key FC/APC
Electrical Outputs	Solderable Half-Vias
Fiber Length and Match	50 cm ± 10 cm Matched to <1 mm (with Connectors)
Fiber Buffer	∅900 µm, Yellow on PD1, White on PD2
Fiber Type	HI1060
Fiber Bend Radius	15 mm (Min)
Dimensions (W x H x D)	45.0 mm x 25.0 mm x 7.0 mm (1.77" x 0.99" x 0.28")
Weight	0.02 kg

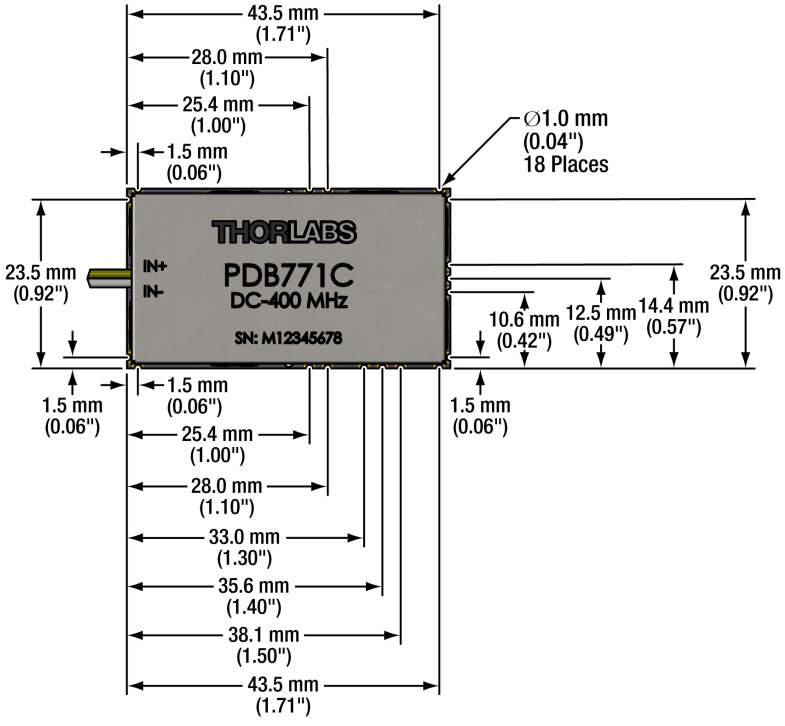
PIN-OUT DIAGRAM



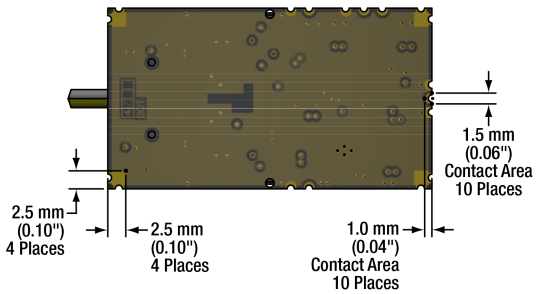
PIN	Description
1	GND
2	GND
3	GND
4	GND
5	OUTPUT MONITOR +
6	GND
7	GND
8	GND
9	RF-OUTPUT
10	GND
11	GND
12	GND
13	Power supply: -9 to -12 V
14	Power supply: +9 to +12 V
15	GND
16	MONITOR -
17	GND
18	GND

MECHANICAL DRAWING



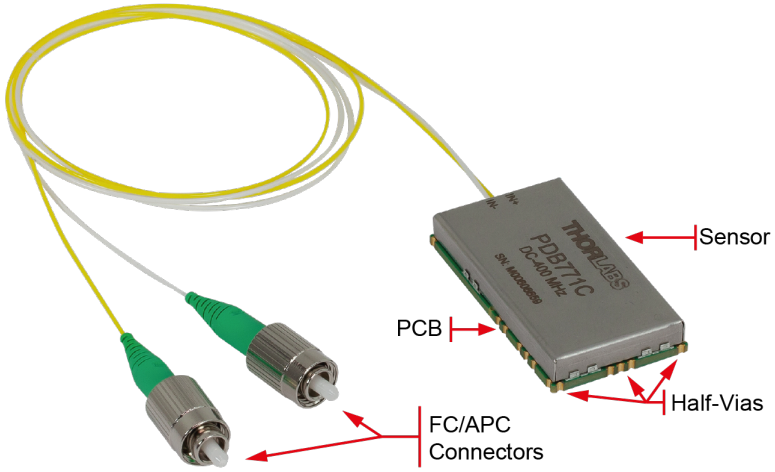


Top View PDB771C



Bottom View PDB771C

OPERATING ELEMENTS



OPERATING GUIDE

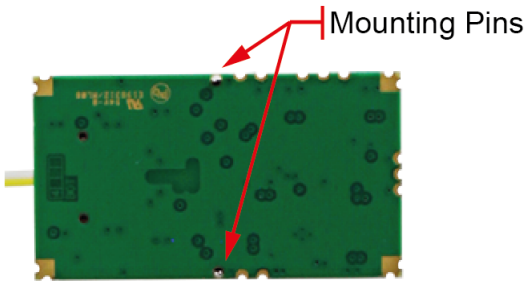
To integrate the detector, a PCB matching the layout of the PDB771C detector is required. The half-vias of the PDB771C are then soldered to respective connectors on the custom PCB. Please see the PCB layout of the PDB771C to design the custom PCB.

Soldering Instructions
Solder all half-vias described in the layout to respective connectors. Soldering of the half-vias needs to be done cleanly and quickly. To avoid damaging the internal opto-electronic components, do not exceed 10 seconds of soldering time at 250 °C for each contact.

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

Mounting

To mount the PDB771C, the mounting pins on either side of the bottom of the PDB771C can be inserted into designed holes in the custom PCB. Please see section Dimensions for precise position of the mounting pins. Please contact Thorlabs for alternative mounting methods.



Bottom view

Mounting on PDBEVAL1

Follow the steps below to mount and solder a PDB771C detector to the PDB evaluation board PDBEVAL1.

1. Insert the two mounting pins on the PDB771C into the two holes near the center of the PDBEVAL1. This will align the PDB771C half-vias with the corresponding contacts on the PDB evaluation board.
2. Add enough flux to the first contact to completely coat the gold half-via and the contact surface on the evaluation board.

3. Using an appropriately sized chisel-shaped soldering tip, add a small ball of solder to the tip of the iron and then apply the iron to the half-via.
4. Ensure the flux activates and the solder wets to both surfaces. The result should be a continuous fillet of shiny solder that bridges both gold surfaces.
5. Allow for cooling before moving to the next contact.
6. Repeat steps 2 through 4 for each of the 18 contacts.

Operational Sequence

Once the PDB771C is mounted and soldered to a custom PCB or PDBEVAL1, it is ready for operation.

1. Connect the PDB771C to a power supply using the respective connectors.

Note When using PDBEVAL1, switch on the PDBEVAL1.

2. Connect the optical sources to the optical inputs. The PDB771C is designed for FC/APC connectors. The yellow fiber connects to the input +. Alternative connectors are available upon request.

Note The two optical input ports are labeled + and -. This label merely distinguishes the two ports.

3. MONITOR output can be used for convenient alignment of a coarse input power balance. The maximum output voltage swing of the MONITOR output is 10 V for high impedance loads. Saturation of the MONITOR outputs will occur at optical input power greater than 1 mW.
4. The RF OUTPUT will be negative when only input port "+" is used and positive when the input port "-" is used. The RF OUTPUT signal must not exceed the maximum RF OUTPUT voltage swing to avoid saturation (see Technical Data).
5. For balanced operation illuminate both photodetectors simultaneously and use the MONITOR outputs to fine-tune the optical power balance by observing voltage on a digital voltmeter or other low-frequency measurement device.
6. After finishing measurements disconnect the PDB771C from the power supply.

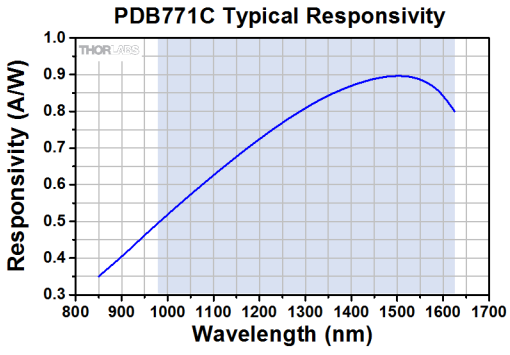
Attention

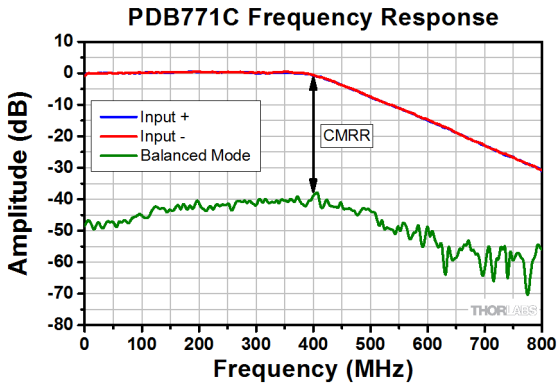
The damage threshold of the photo diodes is 10 mW! Exceeding this value will permanently destroy the detector!

TYPICAL PERFORMANCE GRAPHS

The blue area on the graph showing the typical responsivity marks the operating wavelength range. The performance of each detector is factory tested. Please contact Tech Support if you would like to receive a data file containing these test results. Contact information can be found at http://www.thorlabs.com/locations.cfm.

PDB771C





PRECAUTIONS

Protect the PDB771C from adverse weather conditions. The PDB771C is not water resistant.

Attention To avoid damage to the instrument, do not expose it to spray, liquids or solvents!

The unit does not need a regular maintenance by the user. It does not contain any modules and/or components that could be repaired by the user. If a malfunction occurs, please contact Thorlabs for return instructions.

Do not remove covers!

Attention **ESD-Warning:**

Follow the common recommendations for handling of electrostatic sensitive devices (ESD) as described in the ESD-standard: IEC/TR 61340-5-2 when installing, handling and using this PDB77xC product. Exposure of an ESD to electrostatic discharge may result in damage to the device.

Recommendations for ESD precautions:

Static electricity occurs in our everyday environment, for example when walking along a carpeted floor in a heated room during winter. While the sudden discharge of static electricity does not harm the human body, it can result in damage to electronic devices which are sensitive to electrostatic discharge (ESD). Examples of precautions to avoid static electricity are:

1. Handle ESD devices at static-safe workstations.
2. Wear anti static wrist-straps.
3. Avoid bringing sources of static electricity like plastic bags, blowers or paper within one meter of a static-safe work bench.
4. It is highly recommended for each user to wear antistatic shoes.
5. ESD devices should be contained in a static protective bag or container at all times during storage or transportation.

Attention

The safety of any system incorporating the equipment is the responsibility of the assembler of the system.

All statements regarding safety of operation and technical data in this instruction manual will only apply when the unit is operated correctly as it was designed for.

The PDB771C must not be operated in explosion endangered environments!

Do not open the cabinet. There are no user-serviceable parts inside!

This precision device is only serviceable if returned and properly packed into the complete original packaging including the cardboard inserts. If necessary, ask for replacement packaging.

Refer servicing to qualified personnel!

Changes to this device cannot be made nor may components not supplied by Thorlabs be used without written consent from Thorlabs.

Attention

Prior to applying power to the PDB771C, make sure that the protective conductor of the 3 conductor mains power cord is correctly connected to the protective earth ground contact of the socket outlet! Improper grounding can cause electric shock resulting in damage to your health or even death!

All modules must only be operated with duly shielded connection cables.

Attention

Mobile telephones, cellular phones or other radio transmitters are not to be used within the range of three 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).

MANUFACTURING AND COMPLIANCE

Manufactured by: Thorlabs GmbH, Münchner Weg 1, 85232 Bergkirchen, Germany

All specifications are subject to change without notice.