
Optical probe, Biased PD with 50ohm coaxial output

Features

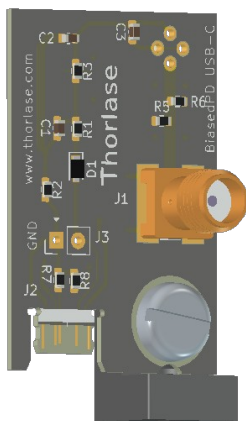
- Wide bandwidth – 1GHz
- Compact
- Prepared for post mount
- USB-C power
- Easy to customize with specialized PD

Applications

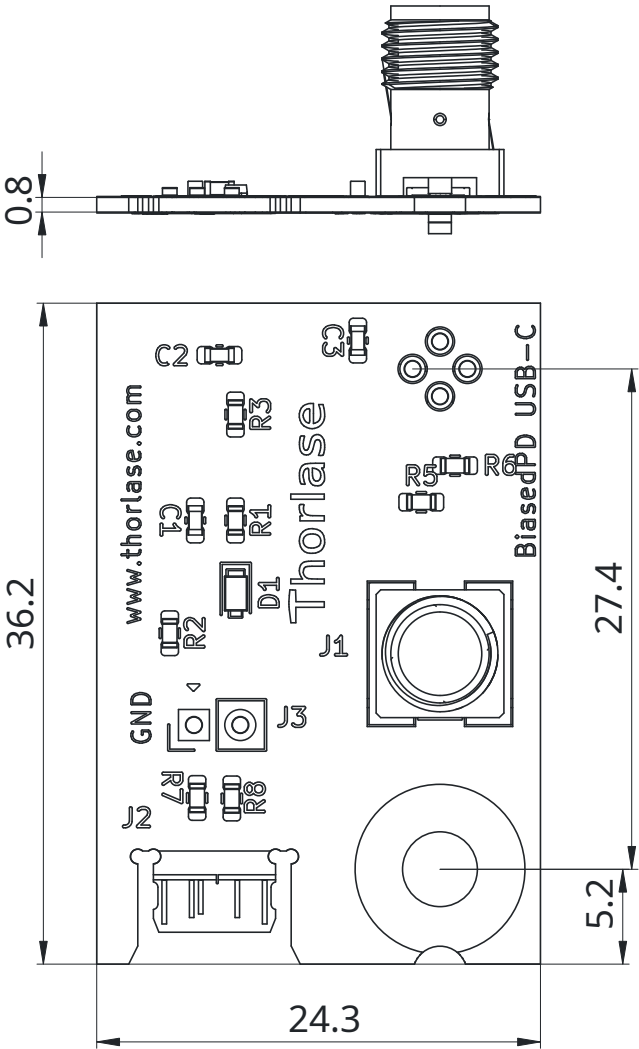
- Optical oscilloscope probe
- Pulsed laser characterization
- Optical link debugging
- Free space optics
- Fiber optics

Description

The Biased_PD_USB-C is a board level solution for operating a PD in photoconductive mode, biased to improve response time. The board can be mounted on an optical post and used for characterizing time varying optical signal. The board has a 50 ohm SMA connector output for connection to an oscilloscope or sampling unit. The board is standard fitted with a 0805 SMD Si PD. The PD can be replaced with any 0805 SMD PD. The board has a through hole PD footprint to accommodate alternative TO can or plastic overmolded PD's.



Drawing (mm)



Absolute Maximum Ratings

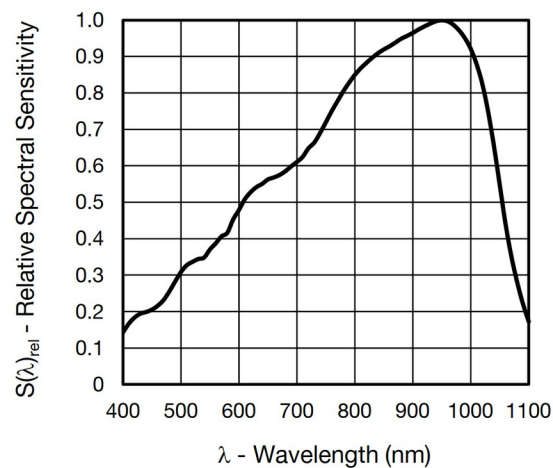
Bias voltage (J3 GND to +5V).....	24V
I _{max_PD}	5μA
Maximum Operating Temperature.....	+50°C
Storage Temperature.....	-5°C to +50°C

Note: Parameters for factory fitted 0805 SMD Si PD.

Specifications

0805 SMD Si photodiode						
Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Active area	A_{act}		0.23		mm ²	
Responsivity range	BW_o	350		1120	nm	
Peak Responsivity wavelength	λ_p		900		nm	
Peak Responsivity	R_p		0.55		A/W	
Output Conversion	V_r		28 in High Z, 14 in 50ohm		V/W	at 900 nm

Relative responsivity



Connector pinning

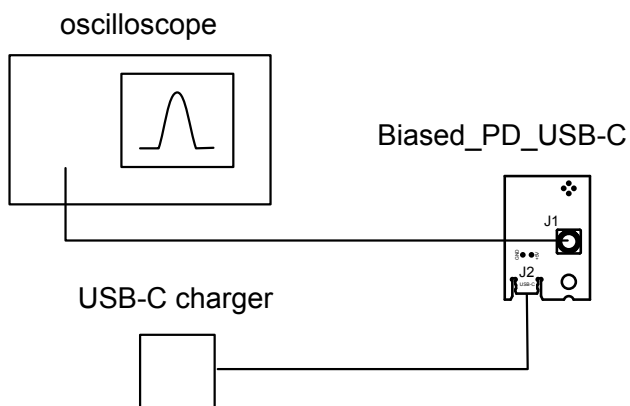
J1 SMA Connector Receptacle, Female Socket 50 Ohms	
pin	Description
1	Vout
2	Earth

J3 HEADER VERT 2POS 2.54MM	
pin	Description
1	GND, Alternative / additional GND connection
2	+5V, Alternative bias supply input. Use when J2 is not connected

J2 USB-C power	
pin	Description
A1	GND
A4	VBUS +5V
A5	CC1 5.1k ohm to GND
A9	VBUS +5V
A12	GND
B1	GND
B4	VBUS +5V
B5	CC2 5.1k ohm to GND
B9	VBUS +5V
B12	GND

Application Information

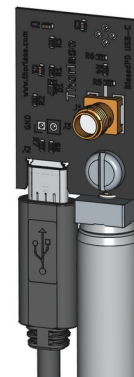
The typical application of the Biased_PD_USB-C is characterization of time varying optical signals. The setup is shown.



The coaxial output J1 from the Biased_PD_USB-C is connected to a 50 ohm oscilloscope input to visualize the signal proportional to the optical power on the PD.

If the oscilloscope only has 1 M ohm input option then an external 50 ohm termination should be used.

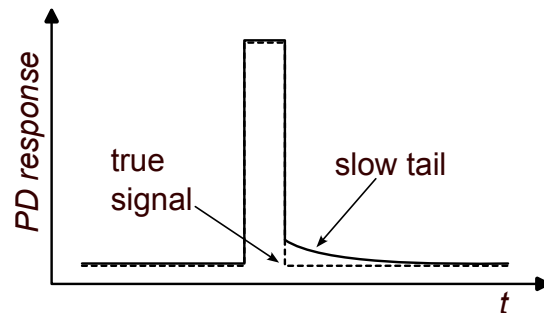
The mechanical arrangement for measuring free space optical beams is shown below.



The board can be mounted on an 1/2 inch optical post with a mounting bracket.

Slow tail

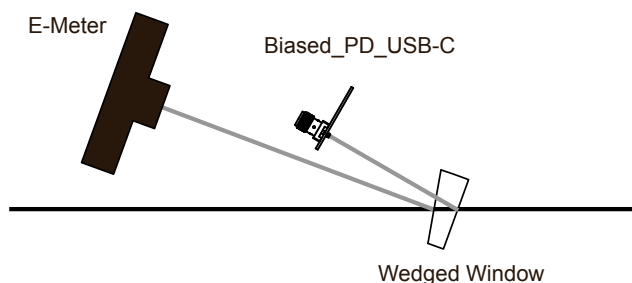
The photodiode bias produce a region where photo induced carriers move by accelerated drift. This give the fast response of the biased PD. There are regions of the PD where there is no or low field even with the bias. If these regions are illuminated induced carriers with move by slow diffusion. This is known as “slow tail” response. In many measurements that effect is insignificant. If it is an issue it can be avoided by only illuminating the center of the PD where there is a bias field. The illumination can be restricted with a focusing lens in front of the PD or by the PD design itself.



There are PD's with a metal film deposited on the PD front facet that blocks illumination outside the biased region (<https://www.oec-gmbh.de/wp-content/uploads/2018/08/No-Slow-Tail.pdf>).

Beam tapping

A good peak power on the PD is around 10 mW peak. To characterize lasers with higher peak power use a beam tap.



An uncoated wedged window makes a good beam tap, beam sampler. Any piece of glass gives ~4% reflection. For smaller tap ratio use an AR coated window. A wedged window prevents interference between front and back facet reflections. The divergence between the two beams gives two tap signals. Use one for the PD and the other for power or energy meter. The small size of the Biased_PD_USB-C allow a compact setup. It takes less distance to separate the beams sufficiently compared to traditional biased PD boxes.

List of accessories

This is a list of accessories that are not included in the kit but are often used together with the kit.

Description	Supplier	Part number
SMA to BNC male cable	SparkFun Electronics	27480
	Amphenol	RF 095-850-249M100
BNC-T COAX ADAPT	Pomona Electronics	3285
CONN TERMINATOR PLUG BNC 50 ohm	Amphenol RF	202104
9V Battery clip, Press Stud 9 V	RS Electronics	489-021
Ø12.7 mm Stainless Steel Optical Post	Ibtek	OP-75
	Thorlabs	TR100/M
Specialty photodiodes	OEC-gmbh	GAP168
	OSI optoelectronics	
Wedged Window	Thorlabs	WW41050
	Lambda	Wedge Windows (WW)

Document control

Version	Apply to	Data
Datasheet_Biased_PD_USB-C	Datasheet_Biased_PD_USB-C BPDUSBC	20261030