

BPR EVB User's Manual

Balanced Photo Receiver Evaluation Board

Caution: The user must read this manual before operating the BPR EVB. Operations other than those described in this manual may result in personal injury and damage to the unit.

Ver. 2.1
January 17th, 2022

Revision History

Version	Date	Summary
1.0	8/18/15	Manual introduced.
2.0	3/16/16	PCB Rev 2. Bypass caps are incorporated.
2.1	1/17/2022	Logo and Format Update

Copyright © 2015 by Optilab, LLC.

All rights reserved.

This document is copyrighted property of Optilab, LLC. It may not be used in whole or in part for manufacture, sale, or design of items without the written permission of Optilab, LLC.

Information herein is preliminary and subject to change without any notices.

Table of Contents

- 1. BPR Configuration..... 1
 - 1.2 Bandwidth Adjustment 2
 - 1.3 Operation Mode 2
- 2. Evaluation Board..... 3
 - 2.1 Device Mounting Procedure 3
 - 2.2 Schematic of Evaluation Board..... 4
 - 2.3 Default Setting 4
 - 2.3.1 How to use manual gain control (MGC) mode 5
 - 2.3.2 How to use automatic gain control (AGC) mode 6
 - 2.4 Operation Instruction 6

1. BPR Configuration

1.1 Butterfly Package Pin-out Diagram and Description

BPR is packaged inside a 14-pin butterfly package. For your reference, we have included a table for the pin-out diagram for the BPR.

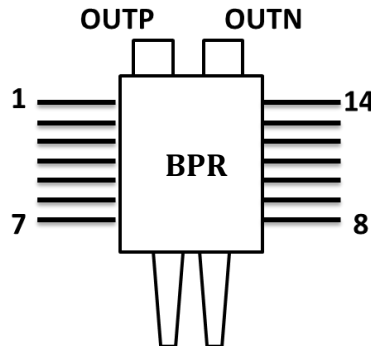


Figure 1 Butterfly Package Pin-out Diagram

Table 1. BPR Pin Out Configuration

Pin 1, 5, 10, 14	Vcc	+2.8 to 3.3 V, abs max current is 93 mA
Pin 2	BWM	Bandwidth Adjust, Sign.
Pin 3	BWA	Bandwidth Adjust, Magnitude.
Pin 4	OA	Output Amplitude Adjust. 0-3.3 VDC adjustment for AGC mode.
Pin 6, 9	GND	Ground
Pin 7	VPD1	PD1 Cathode Connection.
Pin 8	VPD2	PD2 Cathode Connection.
Pin 11	GC	Gain Control. 0-3.3 VDC adjustment for MGC mode. Set to FLT in AGC mode.
Pin 12	MC	Mode Control. GND: MGC mode; FLT: AGC mode; Vcc: Shutdown.
Pin 13	PKD	Peak Detector Output
	OUTP	Positive RF Output, DC coupled out
	OUTN	Negative RF Output, DC coupled out

1.2 Bandwidth Adjustment

BPR offers a bandwidth adjustment feature that allows users to optimize optical receiver performance for different applications. BPR bandwidth can be adjusted as needed. The table below gives the bandwidth based on BWM and BWA settings when both PDs are reversed biased at 3.3V.

Table 2. Bandwidth Setting Lookup Table

Setting	BWM	BWA	Min. Bandwidth (GHz)
1	GND	Vcc	13
2	GND	FLT	15
3	GND	GND	16
4	FLT	FLT	18
5	Vcc	GND	20
6	Vcc	FLT	20.5
7	Vcc	Vcc	21

In default setting on the evaluation board, both BWM and BWA are preset to Vcc to achieve the largest bandwidth. If a bandwidth smaller than 13 GHz is desired, the user can lower VPD1 and VPD2 to further reduce the overall bandwidth of BPR.

1.3 Operation Mode

BPR integrates a single, differential linear trans-impedance / variable-gain amplifier (TIA/VGA). The TIA offers two gain control modes: manual gain control and automatic gain control. In manual mode, MC pin should be connected to GND. The gain is adjustable from 50 Ω to 5000 Ω differential by adjusting the GC level. When MC is floating, BPR is operated in automatic gain control (AGC) mode. In AGC mode, the gain is automatically adjusted to deliver a constant output voltage. The output amplitude is adjustable over 20 dB dynamic range by adjusting the level of OA.

Table 3. Operation Mode Selection

Operation Mode	MC Setting (Pin 12)	Amplitude / Gain Adjustment
Manual Gain Control	GND	GC (Pin 11), 0 ~ 3.3V
Auto Gain Control	Floating	OA (Pin 4), 0 ~ 3.3 V
Shut Down	Vcc	N.A.

The default setting on the evaluation board is MGC. GC is preset to Vcc to maximize the TIA gain.

Optilab, LLC

600 E. Camelback Road, Phoenix, AZ 85012

Phone: 1-888-553-3888, Fax: (602) 343-1489, Email: sales@oequest.com

2. Evaluation Board

The Evaluation Board for the BPR is used for ease of testing. It provides convenient access to all 14 pins and the data output ports. Utilizing a zero-insertion force configuration, the BPR can be mounted without the need for soldering as a user-friendly interfacing solution. The EVB is mounted on a base plate. The base plate can be further mounted to other structures using the four ¼-20 threaded through holes

2.1 Device Mounting Procedure

- i) Place the BPR onto the evaluation board as show in Fig. 2. Pay attention to its orientation. The label P and N denotes the positive and negative RF output ports.
- ii) Align pins down into pin chuck. Make sure that they line up and don't cross over.
- iii) Mount BPR to Evaluation board using the four 2-56 screws provided.
- iv) Once secured clamp pins down in pin chuck, as shown in Fig. 2.

4x 2-25 screws

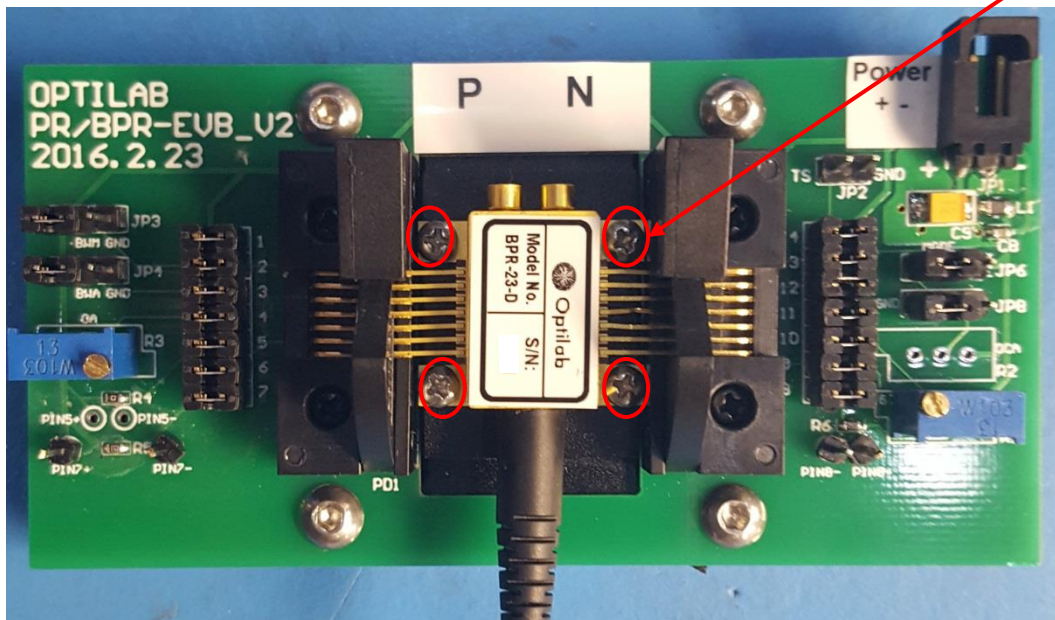


Figure 2. BPR mounting procedure

Optilab, LLC

600 E. Camelback Road, Phoenix, AZ 85012

Phone: 1-888-553-3888, Fax: (602) 343-1489, Email: sales@oequest.com

2.2 Schematic of Evaluation Board

Fig.4 shows the schematic of evaluation board.

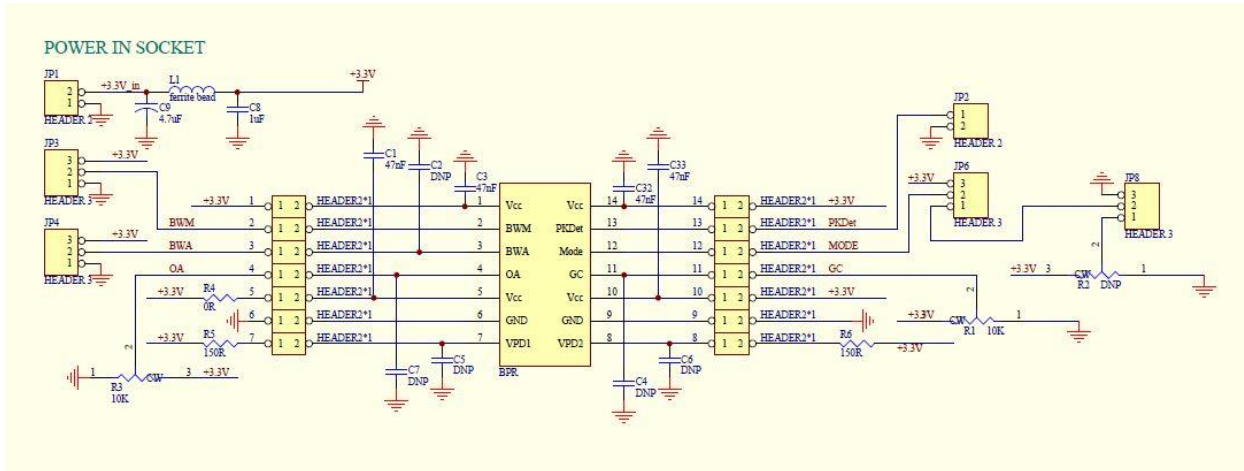


Figure 4. Schematic of Evaluation Board

An external power supply is connected through the power connecting plug. BWM (JP3) and BWA (JP4) are used to select bandwidth setting. Mode (JP6) is for operation mode selection. OA (R3) is used AGC mode for constant output amplitude adjustment. GC (R1) is used manual gain mode for constant gain setting. Test Pins PIN7+/- and PIN8+/- are located on the two ends of R5 and R6 respectively.

2.3 Default Setting

Figure 5 shows an evaluation board in the default setting. Black jumpers (included in the shipment) can be used to make connections between two pins adjacent to each other. The evaluation board has been preset to MGC mode with the highest bandwidth setting. Both PDs are reversed biased at Vcc. The TIA gain is maximized (GC = Vcc).

Optilab, LLC

600 E. Camelback Road, Phoenix, AZ 85012

Phone: 1-888-553-3888, Fax: (602) 343-1489, Email: sales@oequest.com

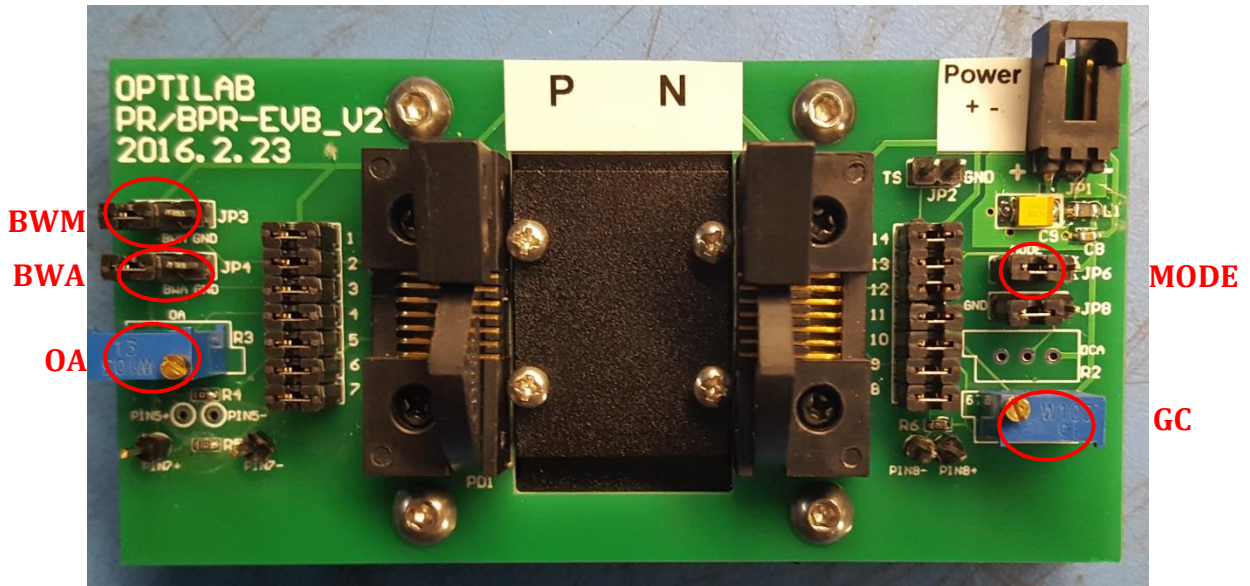


Figure 5. EVB Default Setting and Controls

2.3.1 How to use manual gain control (MGC) mode

To use manual gain control mode, leave evaluation board in its default state, ensure both JP6 and JP8 are jumped on pin 1 and 2. Adjust the differential gain by adjusting the potentiometer GC (R1), clockwise to increase gain.

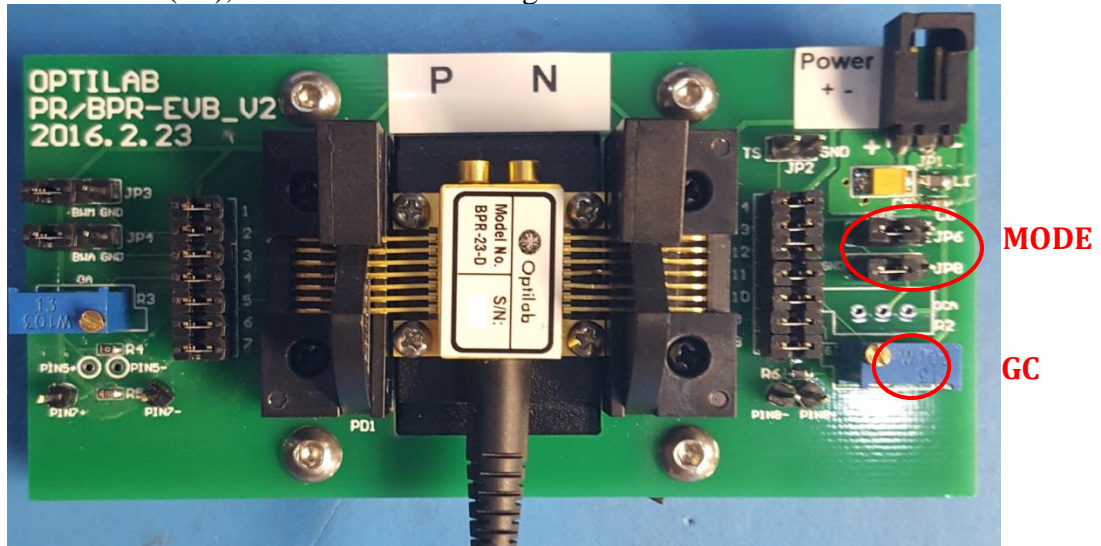


Figure 6. BPR-EVB in MGC Mode

2.3.2 How to use automatic gain control (AGC) mode

To use automatic gain control mode, MC pin has to be set to float and GC pin also has to be floating. First float MODE (JP6). Then remove jumper on pin 11. Adjust potentiometer R3 (OA) to the desired output amplitude, clockwise to increase amplitude.

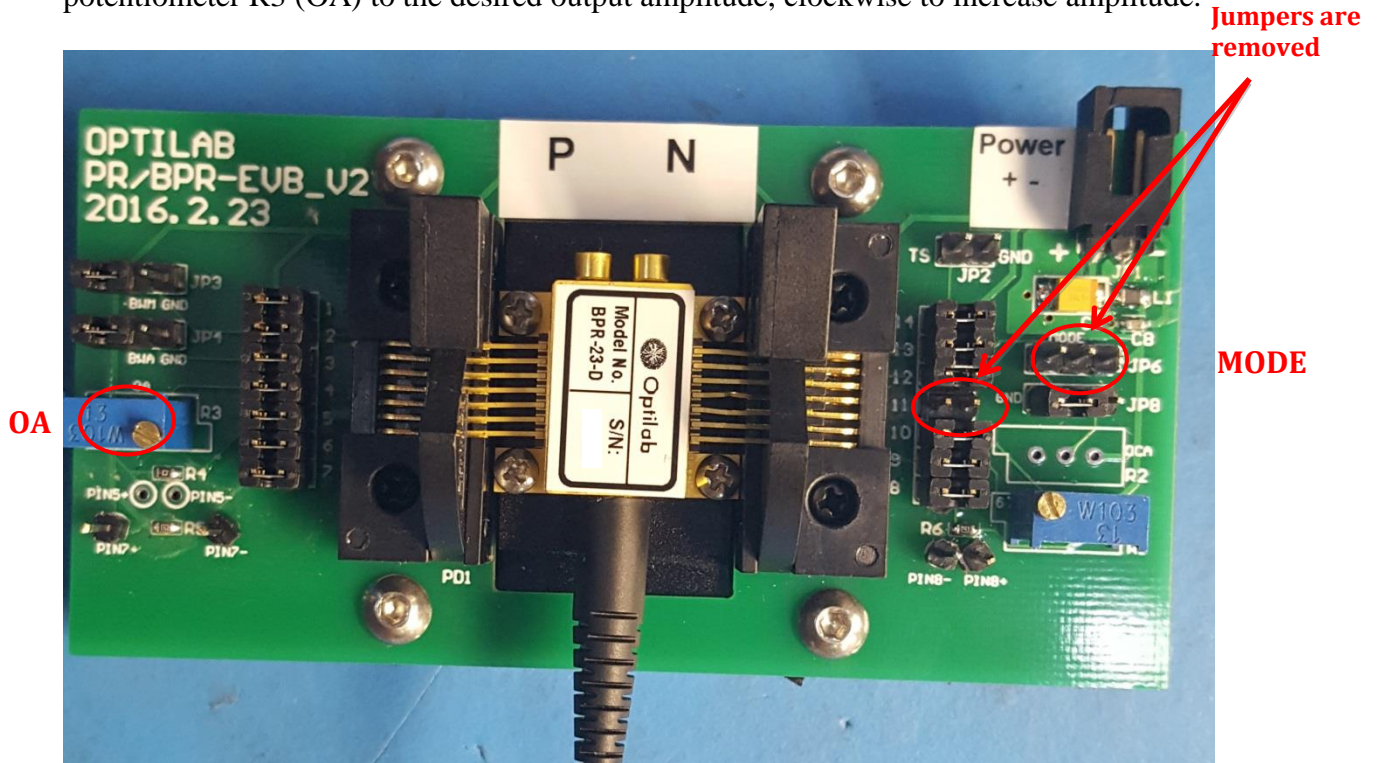


Figure 7. BPR-EVB in AGC Mode

2.4 Operation Instruction

Before powering up BPR make sure evaluation board is at factory default setting (see Fig. 5). This is especially important for first time user. Mount the BPR firmly as instructed in section 2.1. Use ESD strap during the handling.

Connect both RF output ports to the receiver instrument (e.g., CDR circuit, oscilloscope etc.) use a pair of RF cables with GPPPO (SMPM) connector. These two RF output ports need AC coupling. Check the specification and setting of the instrument that BPR is connected to. If DC coupling scheme is used in the corresponding instrument, use external DC blocks in between. **DC coupling causes high current consumption of BPR which may damage its TIA!!**

Connect the 2-pin power connector on the right edge of evaluation board to the external DC power supply. A regulated DC voltage source with low voltage ripple is recommended. Set the current limit to 93 mA. Ramp up the voltage to 3.3V. Now BPR is operated in MGC mode.

To use AGC mode, ramp down DC power then turn off. Follow the instruction in section 2.3.2 to make proper jumpers then ramp up DC power to 3.3V.

Optilab, LLC

600 E. Camelback Road, Phoenix, AZ 85012

Phone: 1-888-553-3888, Fax: (602) 343-1489, Email: sales@oequest.com