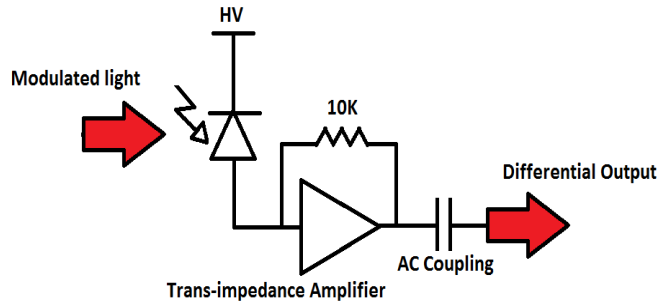
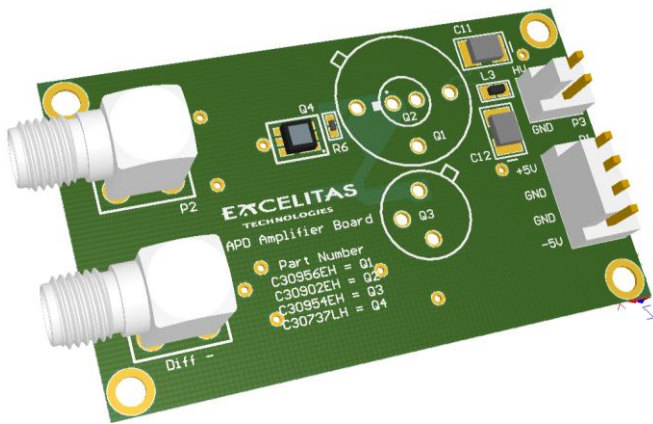


## Avalanche Photodiodes (APD) – APD EVAL BOARD Evaluation Board User Guide



### Overview

Avalanche photodiode detectors (APDs) have and will continue to be used in many diverse applications such as laser range finders, data communications or photon correlation studies. This user guide describes the the function and method to use the evaluation board for testing Excelitas Silicon and InGaAs avalanche photodiodes.

This evaluation module is intended to provide the customer with a simple, turn-key platform to use and test the APDs. This board is designed to be versatile in accommodating four main APD packages: TO-5, TO-8, TO-18 and laminated cermic carrier (LCC). There is a transimpedance amplifier on-board for easy measurement of the APD signal. The customer supplies the low voltage for the amplifier and the high voltage to bias the APD.

### Contents

- Overview
- Installing APD
- Connecting the board
- DC Coupling
- Schematic
- Ordering Guide

### Applications

- Laser range finding
- LIDAR
- Fluorescence detection
- Radiation detection and monitoring
- X-ray detection
- Flow cytometry
- Analytical instrumentation

### Evaluation Board User Guide

#### Evaluation Board Overview

The Excelitas APD Evaluation board includes:

- Fully assembled PCB, **part#: APD EVAL BOARD**

The user will need the following to work with the board:

- APD device
- Modulated light source
- 2x SMA cables
- Molex connector housing, pins and wire
- High voltage power supply (1mA @ 400VDC Max)
- Low voltage power supply (-/+5V 300mA)
- High speed oscilloscope (Recommend: 500MHz, 2-channels)
- Optional: Pomona box (Pomona aluminium die cast box 2417)

Recommendation or precautions to the set up and use:





- High voltage supply current limitation is crucial to protect against improper connection
- The board and APD devices should only be handled at an ESD-safe work station

#### How to install the APD

The standard APD offerings usable with this evaluation board are the hermetic 3pin TO-5, 3pin TO-8, 2pin TO-18 and the laminated ceramic carrier with bottom contact pads.

For surface mount package (LLC, leadless laminated carrier), solder the part onto the appropriate footprint. To remove the part from the PCB, it is preferable to remove the associated “0”  $\Omega$  resistor (R6) and leave the device soldered onto the board. The function of the circuit will not be affected if the resistor is removed.

For hermetic TO-through hole devices, insert the device into the appropriate receptacles. Adjust pins if needed to properly align with socket holes on the PCB:

-  TO-5 to be mounted on Q3 (in yellow)
-  TO-8 to be mounted on Q1 (in blue)
-  TO-18 to be mounted on Q2 (in red)
-  6-pin LLC to be mounted on Q4 (in pink)

See Figure 1 for various package installation positions.

It is recommended to install 1 APD device on the PCB at a time for testing.

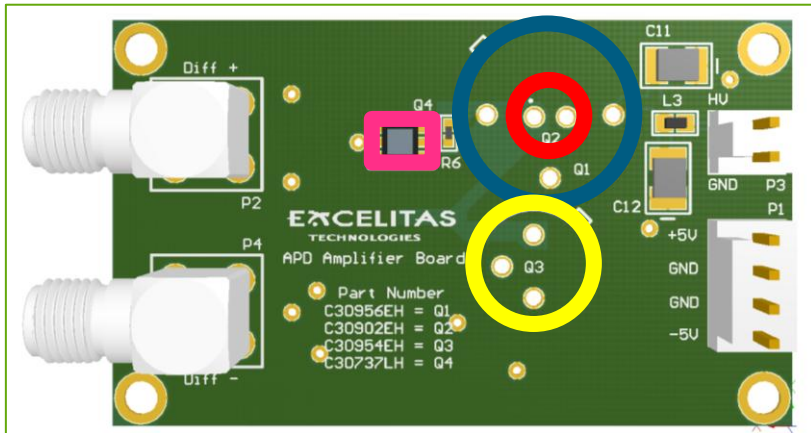


Figure 1: PCB layout

### How to connect the supply voltages to the evaluation board

- The low voltage supply, +/-5V, for the amplifier is to be applied to the P1 connector. Use the MOLEX 22-01-3047 connector housing and corresponding pins to make matching connector. Pinout is indicated on the PCB . Current draw should be around 40mA.
- The high voltage supply for APD bias is to be applied to the P3 connector. Use the MOLEX 22-01-3027 connector housing and corresponding pins to make matching connector. Polarity of the high voltage needs to be verified before applying full voltage.

#### Recommended conditions and set up before applying bias to the APD:

1. Set a low current limit on the high voltage source. (10nA for example)
2. Apply a low voltage to the APD, above the minimum of 3.5V. (4V for example)
3. Verify that the current limit is not reached (as indicated at point 1 above, i.e. 10nA). If the limit is reached, this means the polarity is inverted on the APD. In this case, reverse the polarity of the high voltage bias to resume proper normal operation.
4. Raise the voltage bias and current limit to the operating voltage of the APD, or to the required level for the experiment/testing condition.

### How to make this evaluation DC coupled

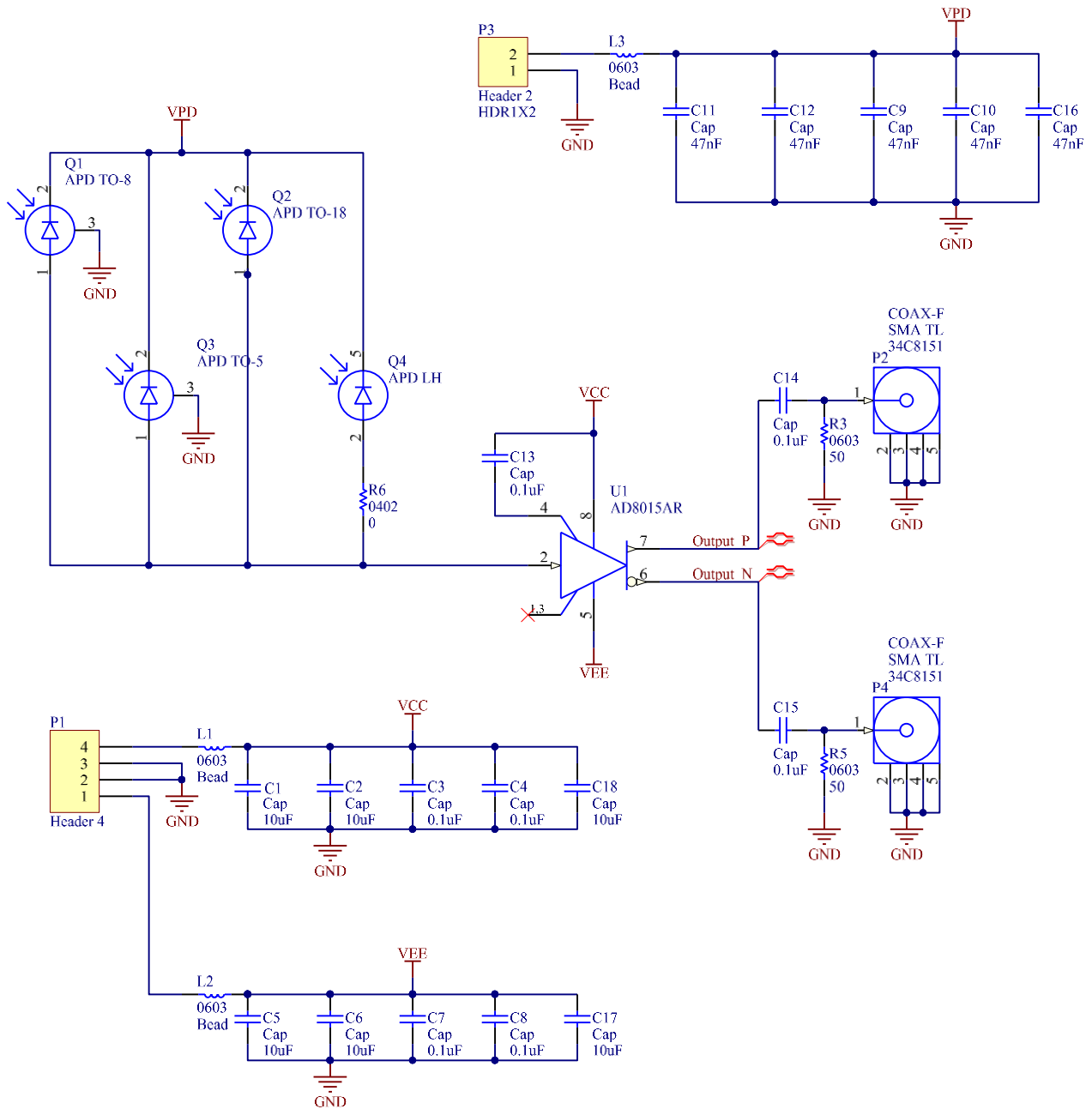
This evaluation board has 2 AC coupled outputs. It is possible to modify the board to allow DC usage. To do so, remove the C14 and C15 capacitor and replace them with a 0Ω resistor. The board can ONLY drive high impedance loads (i.e., 1MΩ) when DC coupled. Should this modification be done to the board, the normal warranty will be void and the board cannot be returned to Excelitas in case of malfunction.

## Evaluation Board User Guide

**Table 1. Electrical specifications**

Parameter	Minimum	Typical	Maximum	Unit
<b>Product</b>				
Low voltage supply	±4.5		±5.5	V
Low voltage current		25	26	mA
Bandwidth		200		MHz
High voltage supply	3.5		450	V
High voltage current			350	uA
Output impedance		50		Ω
Transimpedance				
differential output, 100Ω load		10		kΩ
single ended, 50Ω load		20		kΩ
Output offset voltage				
Normal, AC coupled output		0		V
Modified, DC coupled output (High Z)		3.7		V
Low cut-off frequency		35		kHz
Output voltage swing				
differential output, 100Ω load		0.6		V
single ended, 50Ω load		1		V

Simplified Schematic



## Avalanche Photodiode (APD) – APD EVAL BOARD

### Evaluation Board User Guide

## Ordering Guide

Part Number is: **APD EVAL BOARD**

## About Excelitas Technologies

Excelitas Technologies is a global technology leader focused on delivering innovative, customized solutions to meet the lighting, detection and other high-performance technology needs of OEM customers.

Excelitas has a long and rich history of serving our OEM customer base with optoelectronic sensors and modules for more than 45 years beginning with PerkinElmer, EG&G, and RCA. The constant throughout has been our innovation and commitment to delivering the highest quality solutions to our customers worldwide.

From aerospace and defense to analytical instrumentation, clinical diagnostics, medical, industrial, and safety and security applications, Excelitas Technologies is committed to enabling our customers' success in their specialty end-markets. Excelitas Technologies has approximately 5,000 employees in North America, Europe and Asia, serving customers across the world.

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