PBS - SERIES PHOTOCONDUCTORS

The PBSE-series photoconductors come in room temperature and TE-cooled packages in a variety of active areas. Both single elements and multi-element devices are available, as well as integrated detector/amplifier modules (see the EOS Receivers data sheets).

The PbSe detectors are relatively high resistance devices, ~ 0.2 to 2.0M ohms and require a fixed voltage or current bias to operate. The following is a typical bias circuit, with the output hooking directing into a voltage amplifier. The bias voltage used can vary from on the order of 10V to 100V. Selection of the bias voltage depends on the user's amplifier noise and gain characteristics, and the anticipated optical signal levels. The detector responsivity varies directly with the voltage across the detector, so higher bias levels mean higher signal levels. However there may be other considerations that make lower bias voltages more desirable:

1) The photoconductors all exhibit bias-related 1/f noise which gets worse with higher bias, and given the slow response of the PbSe devices they are often being used in the frequency range in which this is a problem.
2) Lower voltages are usually more readily available in the users' circuits, and have less problems with excess supply noise.
3) Op amps today are readily available with low noise and high gain/bandwidth and can be matched to the detector to meet most requirements.

A design example:

Detector: PBSE-010, 1mm x 1mm active area
Peak Detectivity: 5×10^9 cm-hz$^{1/2}$/W @ 10kHz
Peak Responsivity: 1×10^4 V/W @ V_b = 100V
1×10^3 V/W @ V_b = 10V
Noise Voltage: 200 nV/Hz$^{1/2}$ @ V_b = 100V
20 nV/Hz$^{1/2}$ @ V_b = 10V

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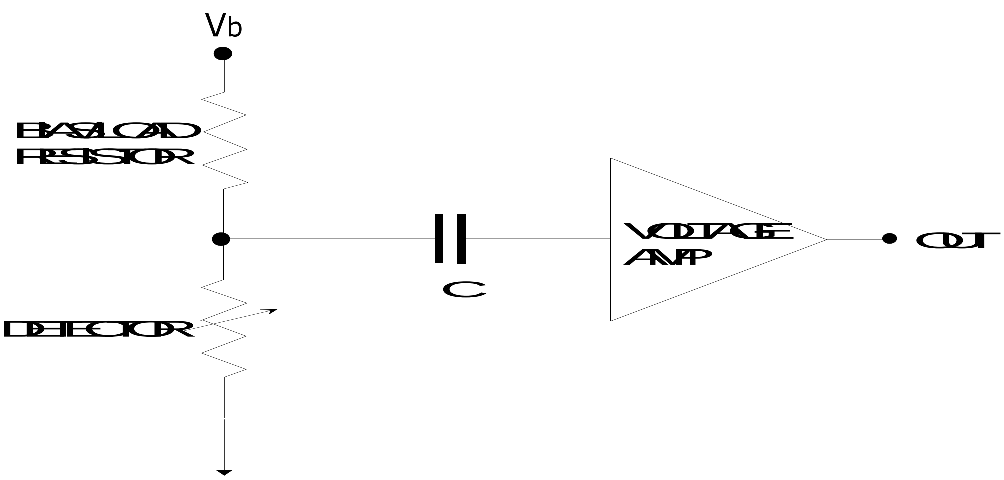
As long as the amplifier used in this case has noise lower than 20nV/Hz$^{1/2}$ the two bias levels will give the same output signal to noise ratio. The magnitude can then be scaled by the gain setting. However if there are extra noise sources such as the 1/f or excess supply noise, the lower bias level will actually result in better performance.



The detector performance is temperature sensitive and care should be taken to provide a stable operating temperature. When using the TE-cooled units care must also be taken to heat-sink the package prior to turning on the cooler. Significant heat is generated on the back side of the package and failure to properly mount the unit can result in catastrophic damage to the cooler and detector. A thermistor mounted on the cold plate is provided for temperature monitoring and closed-loop control.