

AD500-9-400M TO5

Optical Data Receiver using an APD and a High Speed Transimpedance Amplifier

Special characteristics:

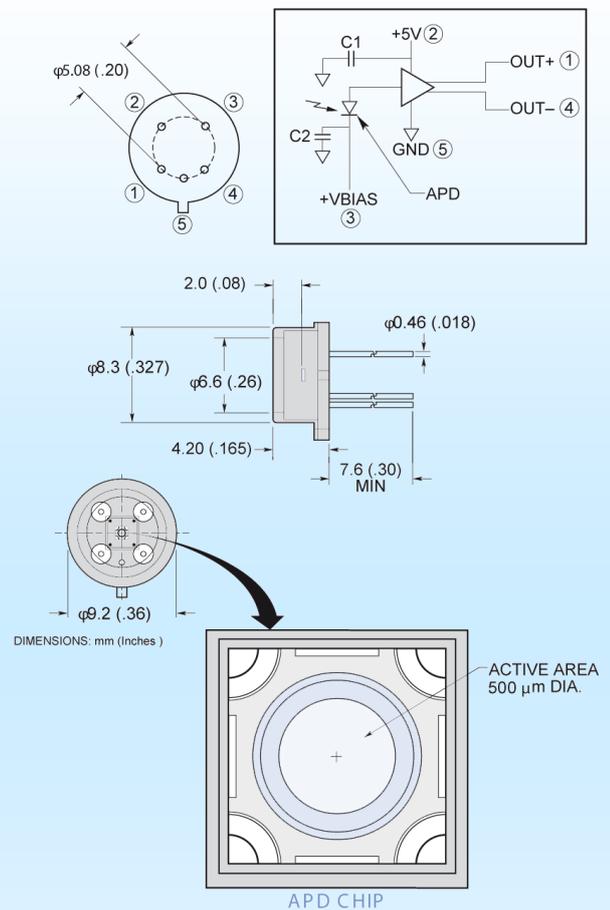
AD500-9-400M-TO5 is a high frequency optical data receiver comprising an Avalanche Silicon Photodiode and a transimpedance amplifier in a hermetically sealed TO-5 package.

Parameters:	AD500-9-400M TO5
Active Area	0,2mm ² Ø 0,5mm
Spectral Responsivity (A/W) (905 nm)	typ. 0,6
Dark current (nA) (I)	typ. 1
Breakdown voltage (V)	260
Capacitance (pF)	1,2
Rise time (ns)	0,55
Temp. Coefficient Ubr (%/°C)	0,4
Cut-off frequency (GHz) (-3 dB)	0,4
Max. Gain	200

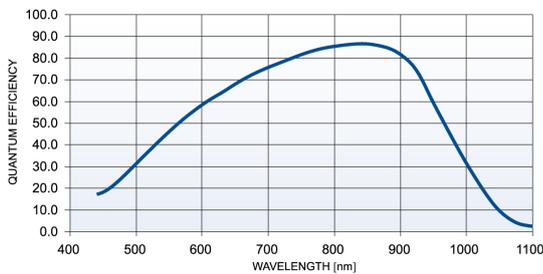
Transimpedance Amplifier Data

Supply Voltage (V)	min. 3 - max. 6 - typ. 5
Supply Current (mA)	typ. 34 - max. 63
Transimpedance (Ω) <i>Differential, measured w. 40 µA p-p Signal</i>	min. 2100 typ. 2750 max. 3400
Output Impedance (Ω) <i>Single ended per Side</i>	min. 48 typ. 50 max. 52
Maximal Differential Output Voltage (mV p-p) <i>Input = 2 mA p-p w/100 Ω differential termination</i>	min. 220 typ. 380 max. 575
AC Input Overload (mA p-p)	2
DC Input Overload (mA)	1
Maximal Differential Output Voltage (mV p-p) <i>TO-5 Package</i>	typ. 490 max. 688
Input referred Noise Density (pA/Hz ^{1/2}) <i>Input Referred Noise is calculated as RMS Output Noise / (Gain at f = 10 MHz), Noise Density is (Input Referred Noise) / √bandwidth</i>	11
Small Signal Bandwidth (MHz) <i>Source Capacitance = 0.85 pF (Source capacitance for AD500-9-400M TO5 is the capacitance of APD)</i>	min. 1525 typ. 2000
Low Frequency Cutoff (kHz) <i>-3dB, Input < 20 µA DC</i>	typ.30
Transimpedance Linear Range (µA p-p) <i>peak to peak 0.95 < Linearity < 1.05</i>	min.40
Power Supply Rejection Ratio (PSRR) (dB) <i>Output referred, f OUT^Δ Vcc</i>	typ.50

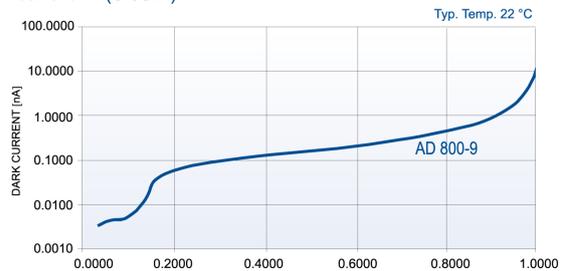
Package (TO5):



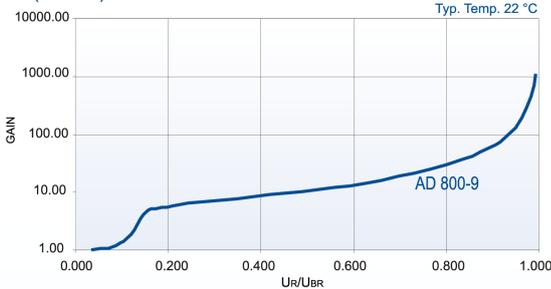
Quantum efficiency for M = 100



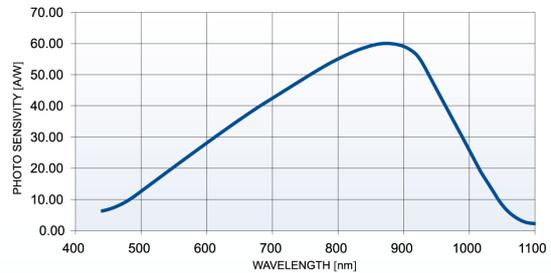
Dark current = f (Ur/Ubr)



Gain = f (Ur/Ubr)



Spectral Responsivity at M = 100



Disclaimer: Due to our policy of continued development, specifications are subject to change without notice.

measurement conditions:

$V_{CC} = +3.0\text{ V to }+5.5\text{ V}$, $T_A = 0\text{ }^\circ\text{C to }70\text{ }^\circ\text{C}$, $100\ \Omega$ load between OUT+ and OUT-. Typical values are at $T_A = +25\text{ }^\circ\text{C}$, $V_{CC} = 3.3\text{ V}$

Application Hints:

The AD500-9-400M TO5 is a high speed optical data receiver. It incorporates an internal transimpedance amplifier with an avalanche photodiode.

This detector requires a +3.5 V to +5.0 V voltage supply for the amplifier and a high voltage supply (100 - 180 V) for the APD. The internal APD follows the gain curve published for the AD500-8-1.3G TO5 avalanche photodiode. The transimpedance amplifier provides differential output signals in the range of 200 mV differential.

In order to achieve highest gain, the avalanche photodiode needs a positive bias voltage. However, a current limiting resistor must be placed in series with the photodiode bias voltage to limit the current into the transimpedance amplifier. **Failure to limit this current may result in permanent failure of the device.** The suggested initial value for this limiting resistor is 390 k Ω .

When using this receiver, good high frequency placement and routing techniques should be followed in order to achieve maximum frequency response. This includes the use of bypass capacitors, short leads and careful attention to impedance matching. The large gain bandwidth values of this device also demand that good shielding practices are used to avoid parasitic oscillations and reduce output noise.

Caution: These parts are extremely static sensitive. Standard ESD precautions must be followed.

Transfer Characteristics:

The circuit used is an avalanche photodiode directly coupled to a high speed data handling transimpedance amplifier. The output of the APD (light generated current) is applied to the input of the amplifier. The amplifier output is in the form of a differential voltage pulsed signal.

The APD responsivity curve is provided. The term A/W involves the area of the APD and can be expressed as $A/\text{mm}^2/\text{W}/\text{mm}^2$, where the numerator applies to the current generated divided by the area of the detector, the denominator refers to the power of the radiant energy present per unit area. As an example assume a radiant input of 1 microwatt at 850 nm. The APD's corresponding responsivity is 0.4 A/W.

If energy in = 1 μW , then the current from the APD = $(0.4\text{ A/W}) \times (1 \times 10^{-6}\text{ W}) = 0.4\ \mu\text{A}$. We can then factor in the typical gain of the APD of 100, making the input current to the amplifier 40 μA . The amplifier output will be approximately 40 mV p-p.

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