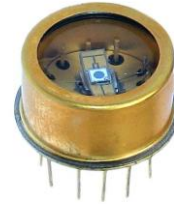


DAPD TO8 TEC Series Discrete Amplification Photon Detector



Amplification Technologies NIRDAPD TEC series photodetector is a near infrared (950nm to 1650nm) photodetector designed for wide-bandwidth analog detection of low-level light signals with sensitivity in the signal pulse that is unique for NIR analog detectors. The sensitivity of the DAPD TO8 TEC spans a wide dynamic range from a single photon, up to approximately 2000 photons per pulse, with an output signal that is proportional to the number of the detected photons.

The DAPD TO8 TEC series takes advantage of the breakthrough Discrete Amplification (DA) method, developed and patented by Amplification Technologies, Inc. Use of DA technology allows high-quality internal amplification with high gain ($>10^5$), fast response (< 0.4 ns rise time) and an extremely low excess noise factor (< 1.05).

The photodetector is packaged in a hermetically sealed TO-8, with a three-stage thermoelectric cooler. Used in conjunction with the DEM2 series Evaluation Module, the DAPD TO8 can operate cooled to -50°C , when the ambient temperature is 25°C .

The DAPD TEC series photodetector is available in two different active area sizes: $80\mu\text{m}$ and $200\mu\text{m}$.

Key Features

Electro-optical

- Near infrared spectral response from 950 to 1650 nm
- Fast response: rise time $< 0.4\text{ns}$
- High gain: at max PDE, $G\sim 100\text{k}$
- Low noise-factor: $F<1.05$
- TEC cooling to -50°C

Applications

- LiDAR 3D imaging
- LiDAR and environmental monitoring
- Spectroscopy and Instrumentation
- Quantum Communications

Specifications (at an operating temperature of -50°C)

| Parameter | DAPD TO8 series | | Unit |
|---|-------------------|-----|------|
| | 80 | 200 | |
| Active area diameter | 80 | 200 | μm |
| Spectral response range (λ) | 950 – 1650 | | nm |
| Typical gain (M) | 1x10 ⁵ | | - |
| Excess Noise Factor | < 1.05 | | - |
| Photon Detection Efficiency @1550 nm (PDE) ¹ | 10 – 20 | | % |
| Single Electron Response pulse width (FWHM) | 1.0 | 1.0 | ns |
| Typical dark count rate | 10 | 25 | Mcps |
| Operating bias | 50 – 80 | | V |

(1) Photon detection efficiency includes cross talk and afterpulsing.

TEC and Thermistor Characteristics

TEC Performance

The TEC is a three-stage cooler, built with high-quality bulk BiTe material it is RoHS compliant, and Telcordia GR-468 qualified.

The following is the TEC performance parameters in ideal conditions:

| Performance Parameters | | | | |
|---------------------------|------------------|------------------|------------------|------|
| dT _{max} | Q _{max} | I _{max} | U _{max} | ACR |
| (°C) | (W) | (A) | (V) | (Ω) |
| @27°C, Vacuum: | | | | |
| 111 | 0.9 | 0.6 | 8.5 | 11.8 |
| @50°C, Dry N ₂ | | | | |
| 116 | 1.0 | 0.6 | 9.5 | 13.2 |

TEC performance quoted is excluding TO package and heat sink arrangement. Practical usage limits the cooling to between -50°C to -55°C

Operation Cautions

The performance-parameters as shown in the table above are obtained with optimal heat dissipation and assuming no load. Careful consideration should be taken to design a proper heat removal from the TO8 header.

For maximum reliability, storage and operation below 85°C in a non-condensing environment is recommended. To minimize thermal stress, use linear/proportional temperature control or a similar method rather than an ON/OFF method.

Thermistor Specification

| Temperature Range | Nominal Resistance | Accuracy |
|-------------------|--------------------|--------------|
| -70 °C to 90 °C | 2.2K Ohms @ 20°C | +/-5% @ 20°C |

The **Steinhart-Hart equation** is given as follows:

$$1/T = (C1 * 10^{-3}) + (C2 * 10^{-4})(\ln R) + (C3 * 10^{-7})(\ln R)^3$$

Where: T is expressed in Degrees KELVIN (K) ; R in Ohms (Ω)

Using the above equation, the **Steinhart-Hart** coefficients are: (2.2k Ω at 20°C):

$$C1=0.7757$$

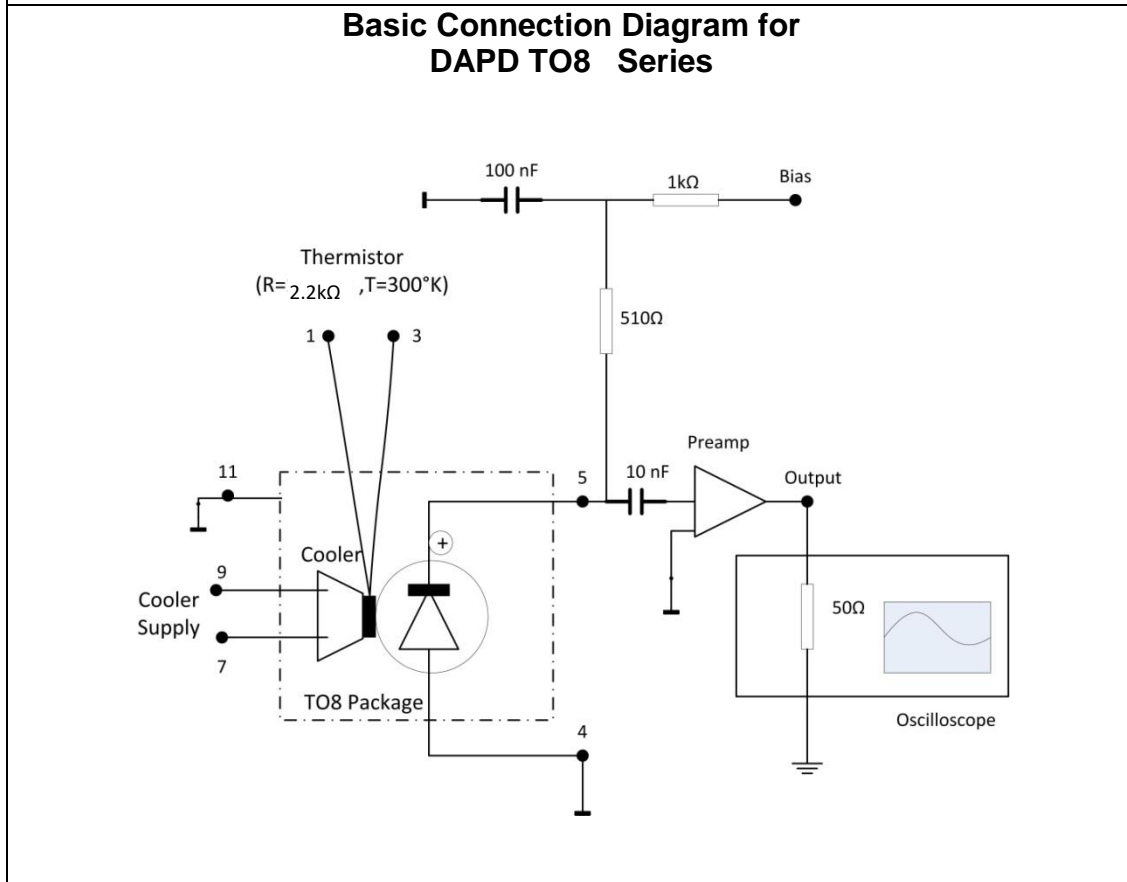
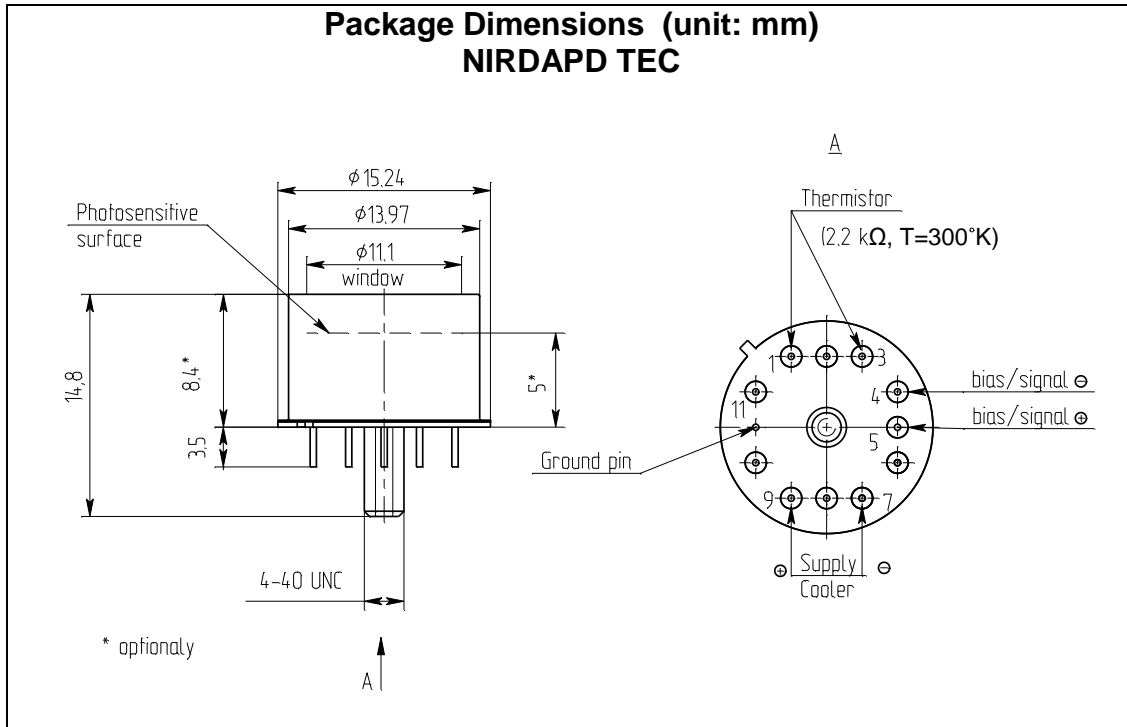
$$C2=3.424$$

$$C3=0.002$$

The range is -70°C to +90°C.

Note to insert the coefficients values into a temperature controller without the exponential, hence the C1, C2, and C2, as this version of the Steinhart-Hart equation defines these parameters differently than the A, B, and C parameters, which include the exponential component.

Package Mechanical Dimensions



NIRDAPD TEC Series



Precautions for Use

These devices are ESD sensitive. Use of grounding straps, anti-static mats and other standard electrostatic discharge protective equipment and methods are recommended when handling or testing these devices.

Quality Vision

Amplification Technologies Inc is committed to providing products with the highest levels of quality and reliability using best available manufacturing processes. Our top priority is total customer satisfaction. Amplification Technologies Inc maintains a strict quality control program to ensure that all products meet or surpass published specifications.

Ordering Information

When ordering, please specify the following information: DAPD TO8-XXX where XXX corresponds to the photodetector chip active area. Please call for other custom options such as custom chip active area, custom optical windows, etc.

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