C30659-UV-1

UV APD Preamplifier Module

Excelitas' C30659-UV-1 APD Preamplifier Module enables high responsivity at 500 nm and offers a very low noise floor.

Excelitas Technologies' C30659-UV-1 includes a UV enhanced Si Avalanche Photodiode (APD) with a hybrid preamplifier, in the same hermetically-sealed TO-8 package, to allow for ultra low noise operation.

The UV Enhanced Si APDs provide very good response between 400 nm and 950 nm and have very fast rise- and fall-times at all wavelengths. The preamplifier section of the module uses a very low noise GaAs FET front end designed to operate at higher transimpedance than our regular C30950 Series.

The C30659 is pin-to-pin compatible with the C30950 Series with a negative output. An emitter follower is used as an output buffer stage. To obtain the wideband characteristics, the output of these devices should be capacitively- or AC-coupled to a 50 Ω termination. The module must not be DC-coupled to loads of less than 2,000 Ohms. For field use, it is recommended that a temperature-compensated HV supply be employed to maintain a constant responsivity over temperature.

Customization of the C30659 Series of APD Preamplifier Modules is available to meet your specific design challenges.

Key Features

- 50 MHz system bandwidth
- Ultra low noise equivalent power (NEP)
- Blue enhanced spectral response range
- Power consumption: 150 mW typ
- ±5 V amplifier operating voltages
- 50 Ω AC load capability
- Hermetically-sealed TO-8 package
- High reliability
- Pin-to-pin compatible with the C30950 & C30659 Series
- Light entry angle, over 130°
- RoHS-compliant

Applications

- Fluorescence detection
- High energy physics
- Safety radiation detection
- Optical tomography
- Environmental monitoring

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Table 1. Performance Specifications

Test conditions: Case temperature = 22˚C, V_{amp} = ±5 V, HV = V_{op} (see Note 1), R_L = 50 Ω AC coupled)

Parameter	Min	Typical	Max	Units
Active area		1 x 1		mm²
Bandwidth range		50		MHz
Temperature coefficient of V_{op} for constant gain		1.0		V/˚C
V_{op} for specified responsivity	350	Note 1	430	V
Temperature sensor sensitivity (Note 2)	-1.8	-2.1	-2.4	mV/˚C
Responsivity at 500 nm R_f (Internal feedback resistor)		 3000 82		 kV/W kΩ
Noise equivalent power (NEP) (Note 3) Average from 100 kHz to f_{-3dB}, Δf = 1.0 Hz at 500 nm Output spectral noise voltage Averaged from 100 kHz to f_{-3dB}		 10 30	 12 35	 fW/√Hz nV/√Hz
Output impedance	33	40	50	Ω
System bandwidth, f_{-3dB}	40	50		MHz
Rise time, t_r (λ = 500 nm) 10% to 90% points		7		ns
Fall time, t_f (λ = 500 nm) 90% to 10% points		7		ns
Output voltage swing (1 kΩ load) (Note 4)	2	3		V
Output voltage swing (50 Ω load) (Note 4)	0.7	0.9		V
DC output offset voltage	-1	0.25	1	V
Positive supply current (V_+)		20	35	mA
Negative supply current (V_-)		10	20	mA

Notes:

1. A specific value of V_{op} is supplied with each device. The V_{op} value will be within the specified range.
2. I_f = 0.1 mA at 25˚C.
3. NEP is the calculated as the average output spectral noise voltage divided by the typical responsivity.
4. Pulsed operation.

Table 2. Absolute – Maximum Ratings, Limiting Values

Parameter	Min	Max	Units
Photodiode bias voltage at T_A = +70˚C at T_A = -40˚C		 600 300	 V V
Case temperature storage, T_{stg} operating, T_A	 -50 -40	 100 70	 ˚C ˚C
Preamplifier bias voltage	±4.5	±5.5	V

Figure 1. Schematic Block Diagram – C30659 Series

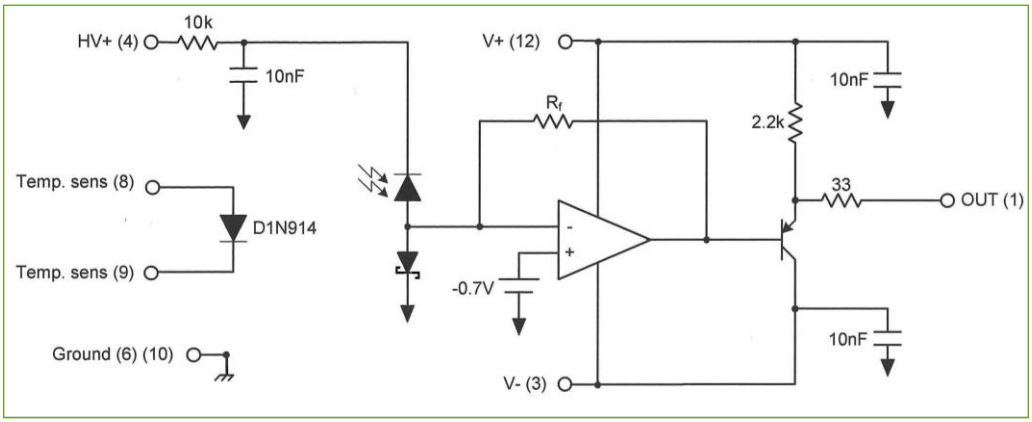


Figure 2. Typical Spectral Responsivity

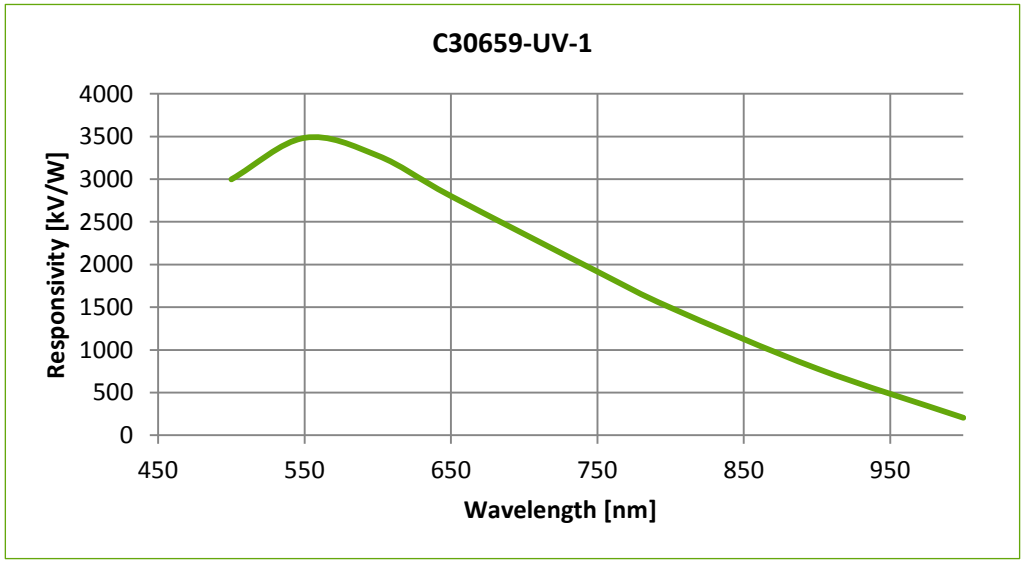
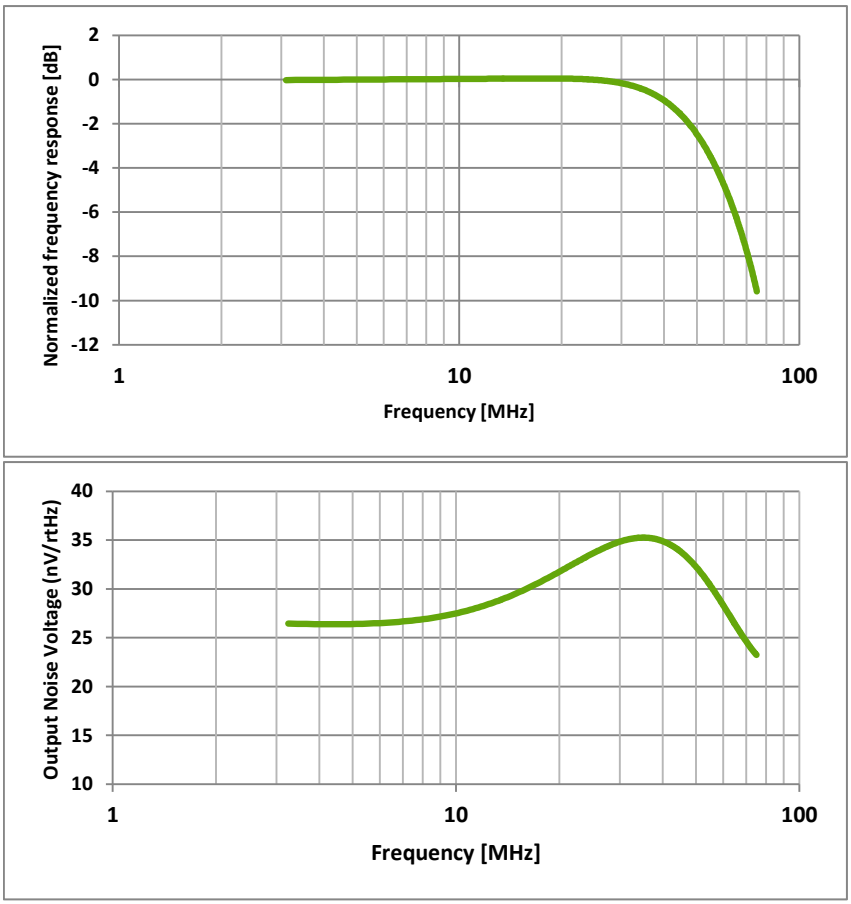


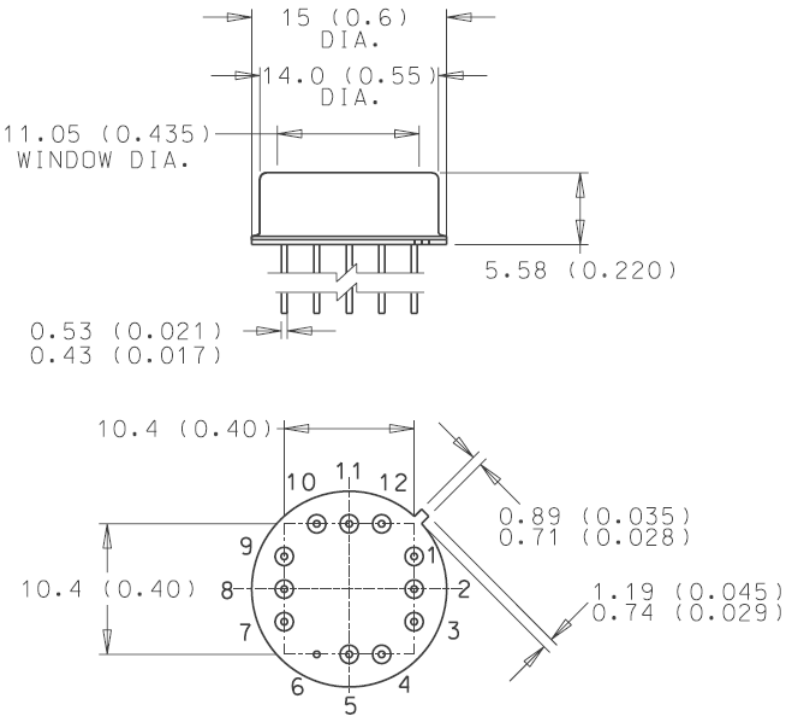
Figure 3. Typical Noise and Frequency



Output voltage noise normalization is calculated using the following formula:

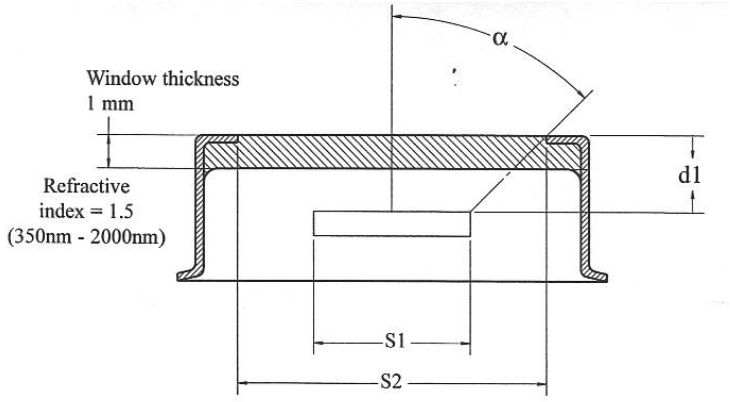
$$V_{n_{normalize}} = \frac{V_n}{V_{n_{average}}}, \text{ where } V_{n_{average}}\left[\frac{V}{\sqrt{Hz}}\right] = \sqrt{\frac{\int_{100kHz}^{f_{-3dB}} V_n^{\,2} \cdot df}{f_{-3dB}}}$$

Figure 4. Mechanical Characteristics – C30659 Series – reference dimensions shown in mm (inches)



Pin #	Description
1	Output signal
2	No connection
3	$-V_{cc}$ negative amplifier bias
4	Positive high voltage (HV)
5	No connection
6	Case ground
7	No connection
8	Temperature sensing diode – anode
9	Temperature sensing diode – cathode
10	Ground, DC returns
11	No connection
12	$+V_{cc}$ positive amplifier bias

Figure 5. Optical Geometry – C30659 Series – reference dimensions shown



Model	S1 (mm)	S2 (mm)	d1 (mm)	α (deg)
C30659-UV-1	1.1	11	1.6	74

RoHS Compliance

The C30659 Series of APD Preamplifier Modules are designed and built to be fully compliant with the European Union Directive 2002/95EEC – Restriction of the use of certain Hazardous Substances (RoHS) in Electrical and Electronic equipment.

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 3,000 employees in North America, Europe and Asia, serving customers across the world.

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