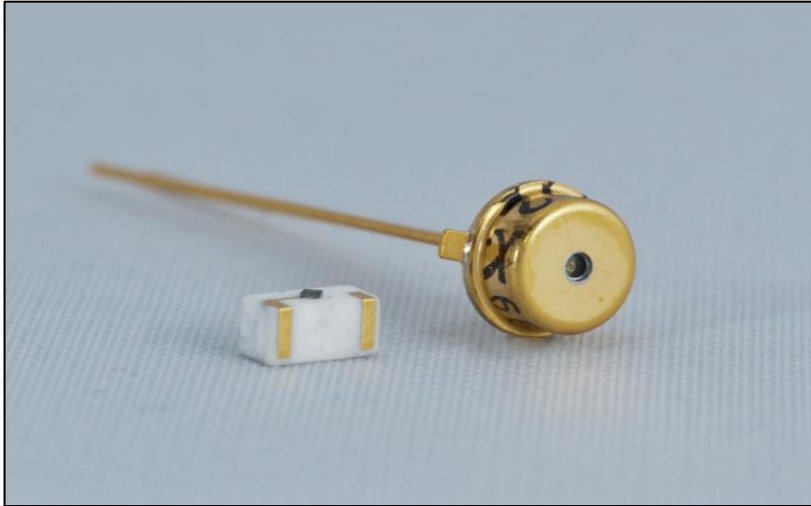


C30645 and C30662 Series

Large Area InGaAs Avalanche Photodiodes



The C30645 and C30662 Series Avalanche Photodiodes are high speed, large area InGaAs/InP APDs that provide large QE, high responsivity, and low noise.

Excelitas Technologies' C30645 and C30662 Series APDs are high speed, large area InGaAs/InP avalanche photodiodes. These devices provide large quantum efficiency, (QE), high responsivity and low noise in the spectral range between 1100 nm and 1700 nm. They are optimized for use at a wavelength of 1550 nm, suitable for use in eye-safe laser range finding systems.

These APDs are supplied in a hermetically sealed TO-18 package or on a ceramic carrier. Custom packaging is also available. Please contact Excelitas to discuss the packaging in further detail. Excelitas is committed to supplying the highest quality product to our customers.

Excelitas Technologies is certified to meet ISO-9001 and are designed to meet MIL-STD-883 and/or MIL-STD-750 specifications.

All devices undergo extended burn-in and periodic process qualification programs to assure high reliability.

Key Features

- Spectral response 1100 - 1700 nm
- High responsivity
- Low dark current and noise
- Large area
- RoHS-compliant
- Available with lead-solder

Applications

- Eye-safe Laser Range Finding
- Optical time-domain reflectometer (OTDR)
- Optical communication systems

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Table 1: Electrical Characteristics at T_A = 22°C

Parameter	C30645			C30662			C30662-1			Units	Conditions
	Min	Typ	Max	Min	Typ	Max	Min	Typ	Max		
Active Diameter		80			200			200		μm	
Breakdown voltage (V _{br})	45	50	70	45	50	70	45	50	70	V	
Operation Point from Breakdown (V _{br} -V _{op})							4.0			V	(@ M=10) (Note 6)
Temperature Coefficient of V _{br} for Constant Gain		0.14	0.20		0.14	0.20				V / deg C	
Responsivity (@ 1550 nm)	9.3			9.3						A/W	
Dark Current (@ M=10) (i _d)		3	50		45	150				nA	
Spectral Noise Current (@ M=10) (i _n)		0.2	1.0		0.7	1.5				pA/rt(Hz)	
Capacitance		1.25			2.5					pF	
Bandwidth (@ M=10)	1000			600	850					MHz	
Quantum Efficiency (1300-1550 nm)	75			75						%	
Maximum Useable Gain (M)	10	20		10	20					No units	

Notes for Table 1

1. A specific voltage, V_{op}, is supplied with each device. When the photodiode is operated at this voltage (at 22 °C), the device will meet the electrical characteristic limits shown above. The voltage value will be within the range of 45 to 70 volts.

2. The voltage dependence of the gain, *M*, for gains above 4, is given approximately by the following empirical formula yielding a rough approximation of the sensitivity:

$$M \sim \frac{K}{V_{br} - V_{op}}$$

where:

K will vary from APD to APD, but should be within 40-50 for most InGaAs APDs

3. Gain, *M*, and quantum efficiency, *η*, are not directly measurable quantities. The numbers quoted are estimated typical values. Gain, quantum efficiency and responsivity are related by the following:

$$R = \frac{\eta \lambda M}{1.24} \text{ expressed in A/W}$$

where:

η is the quantum efficiency, expressed in %

λ is the wavelength in units of mm, and

M is the APD gain

4. The detector noise current expressed in 1/√Hz, is given by the following expression:

$$i_n = \sqrt{2q(i_s + i_b M^2 F)}$$

where:

q is the electron charge,

F = *k_{eff}**M* + (1 - *k_{eff}*) (2 - $\frac{1}{M}$), is the excess noise factor, around 5.5 for InGaAs,

k_{eff} is ionization coefficient, typically around 0.45 for InGaAs, and

i_s and *i_b* are the un-multiplied and multiplied portions of the dark current, respectively.

The total dark current is given by:

$$i_t = i_s + i_b M$$

However, since both *i_s* and *i_b* are somewhat voltage dependent, and *M* is not directly measurable (see Note 3), it is not usually possible to determine both *i_s* and *i_b* unambiguously. Since system performance depends on noise current and responsivity, these measurable quantities are the ones that have been specified.

5. Most devices can be operated at gains up to about 30 or more, but with values of noise current correspondingly higher, as indicated by the discussion in Note 4 above.
6. The product C30662EH can be ordered with a guaranteed minimal delta of the operation voltage bias from the voltage breakdown (V_{br}-V_{op}), also known as *deltaV* or *dV*. Using the “-1” suffix specifies a *dV* larger than 4.0 V. Please contact us for more information.

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Table 2: Absolute Maximum Rating, Limiting Values

	Parameter	Units
Forward Current	5	mA
Total Power dissipation	20	mW
Storage Temperature	-60 to +125	°C
Operating Temperature	-20 to +70	°C
Soldering Temperature (10 seconds)	250	°C

Figure 1: Spectral Responsivity Curve as a function of wavelength (M = 10)

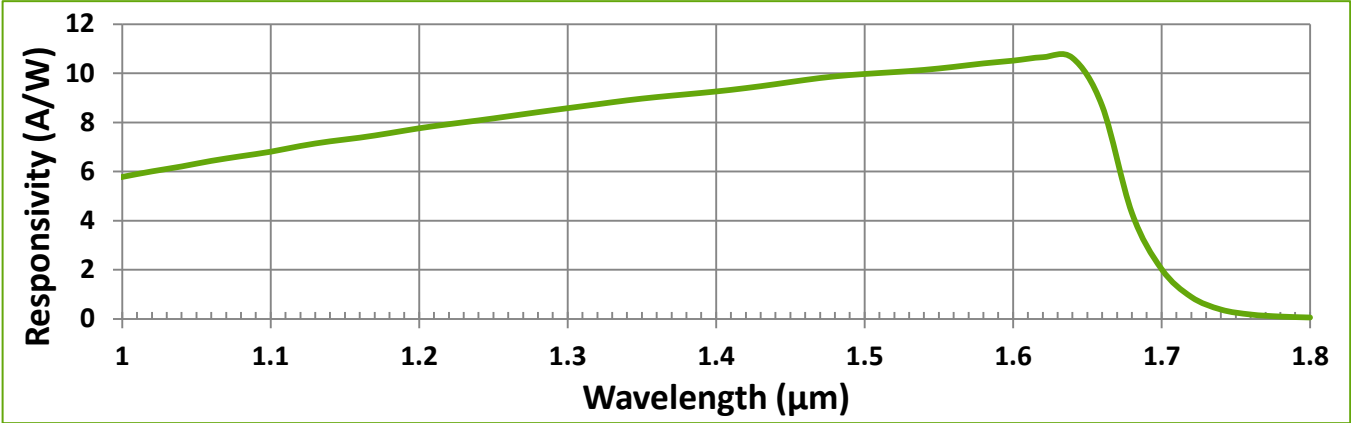


Figure 2: Typical Gain, M, as a function of voltage bias

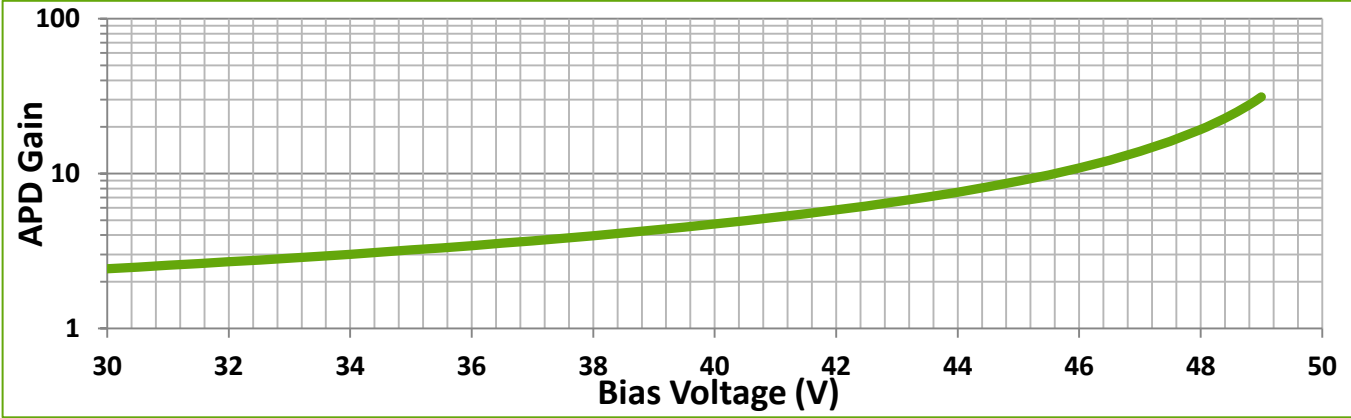
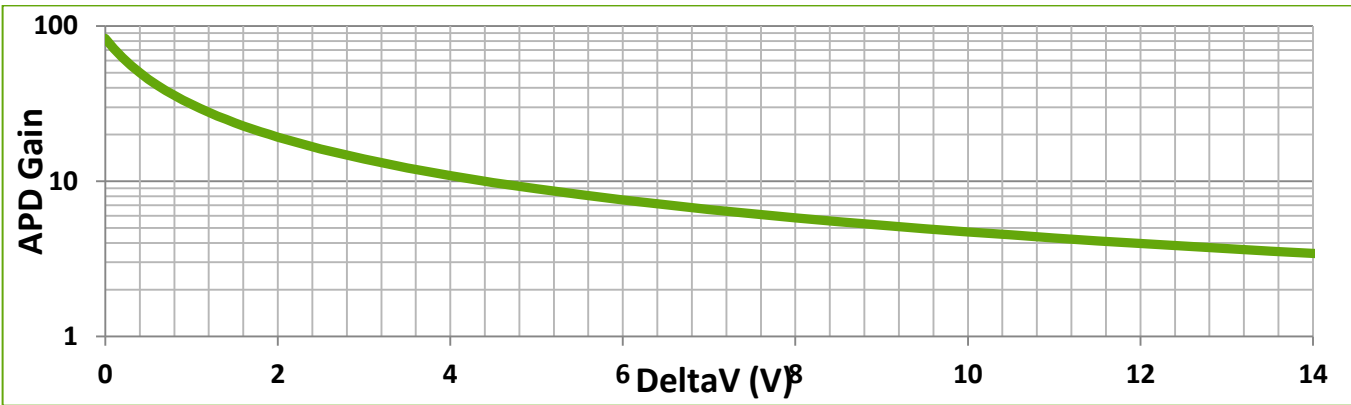


Figure 3: Typical Gain as a function of ΔV , $V_{br}-V_{op}$



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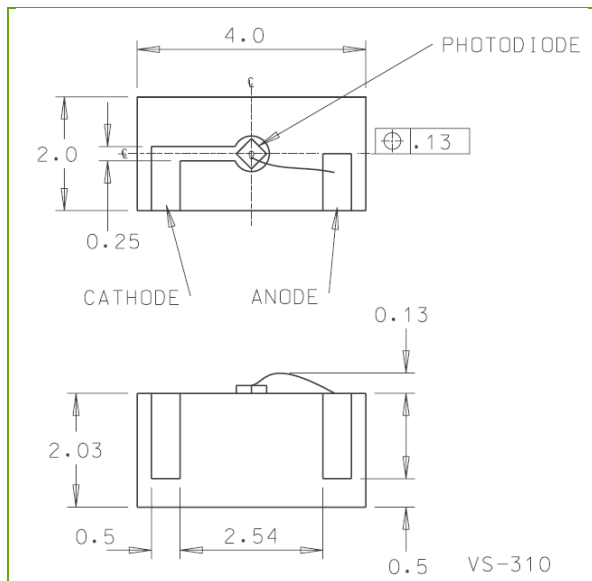
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Table 2: Ordering Guide and Packaging information

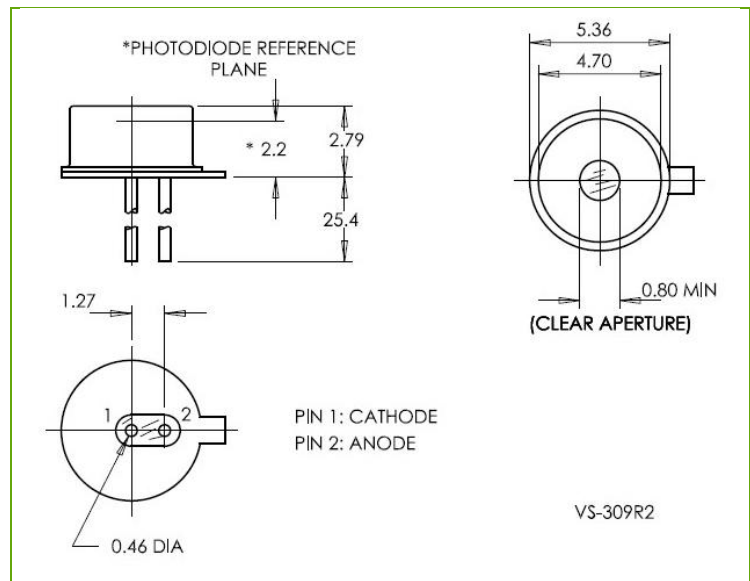
Model	Active area	Package Type	Package reference	Window		RoHS compliance?	Additional screening
				Material ¹	Aperture		
C30645ECERH	80µm diameter	Ceramic Carrier	See Figure 4	N/A	N/A	Yes	
C30645E		Standard TO-18	See Figure 5	Silicon	Small	No	
C30645EH		Standard TO-18	See Figure 5	Silicon	Small	Yes	
C30645EH-1		Standard TO-18	See Figure 6	Glass	Large	Yes	
C30662ECERH	200µm diameter	Ceramic Carrier	See Figure 4	N/A	N/A	Yes	
C30662ECERH-1		Ceramic Carrier	See Figure 4	N/A	N/A	Yes	dV > 4.0V
C30662E		Standard TO-18	See Figure 5	Glass	Small	No	
C30662EH		Standard TO-18	See Figure 6	Glass	Large	Yes	
C30662EH-1		Standard TO-18	See Figure 6	Glass	Large	Yes	dV > 4.0V
C30662EH-3		Standard TO-18	See Figure 5	Glass	Small	Yes	

Notes: 1. Glass material is transparent for visible and IR wavelengths, while Silicon blocks visible light up to about 1.1µm.

**Figure 4 : Ceramic package
(reference dimensions, in mm)**



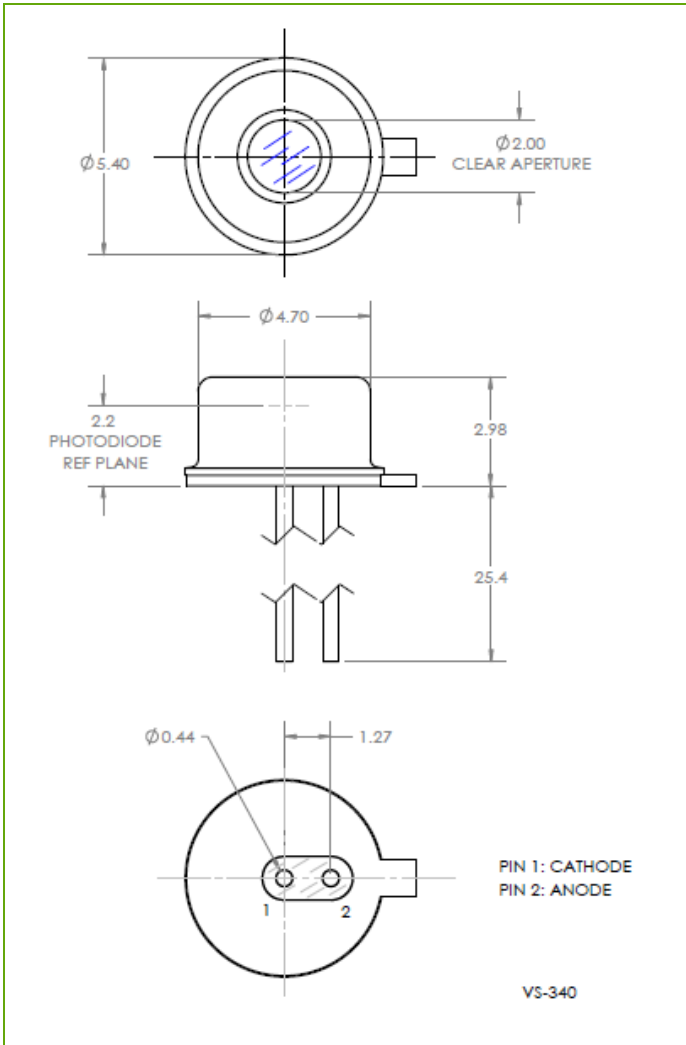
**Figure 5 : Standard TO-18, small aperture
(reference dimensions, in mm)**



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Figure 6: Standard TO-18, large aperture (reference dimensions, in mm)



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 analytical instrumentation to clinical diagnostics, medical, industrial, safety and security, and aerospace and defense 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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