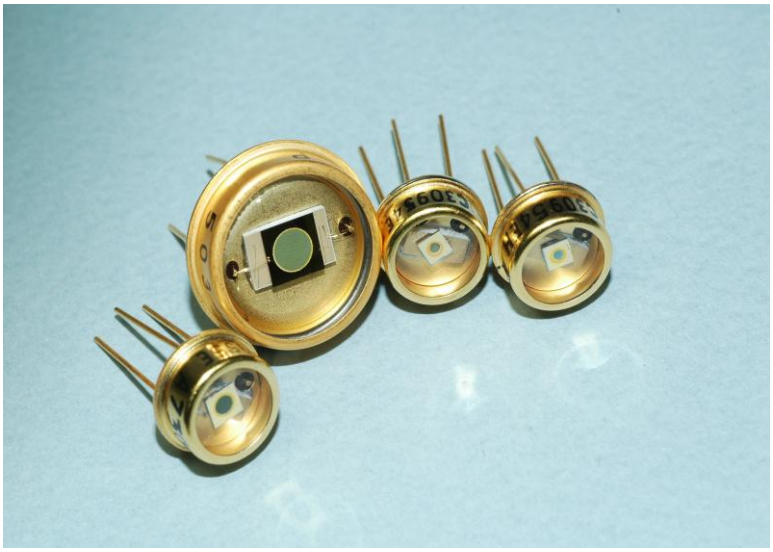
C30954EH, C30955EH and C30956EH Series

Long Wavelength Enhanced Silicon Avalanche Photodiodes for range finding, LIDAR, and YAG laser detection



Excelitas' C30954EH, C30955EH, and C30956EH are general purpose silicon avalanche photodiodes made using a double-diffused "reach through" structure. The design of these photodiodes is such that their long wave response (i.e. > 900 nm) has been enhanced without introducing any undesirable properties.

These APDs have quantum efficiency of up to 40% at 1060 nm. At the same time, the diodes retain the low noise, low capacitance, and fast rise and fall times characteristics.

Standard versions of these APDs are available in hermetically-sealed, flat top glass TO-5 packages for the smaller area C30954EH and C30955EH, and a TO-8 package for the larger area C30956EH.

To help simplify many design needs, these Si APDs are also available in Excelitas' high-performance hybrid preamplifier module, C30659 Series, as well as the preamplifier and Thermo-electric (TE) cooler incorporated module, the LLAM Series.

Recognizing that different applications have different performance requirements, Excelitas offers a wide range of customization options for these APDs to meet your design challenges. TE cooler-packaged versions are available on a custom basis. Operating and breakdown voltage selection, dark current and NEP screening, custom device testing and packaging are among the many application-specific solutions available.

Key Features

- High quantum efficiency at 1060 nm
- Fast response time
- Wide operating temperature range
- Low capacitance
- Hermetically-sealed packages
- RoHS-compliant

Applications

- Range finding
- LIDAR
- YAG laser detection

EXCELITAS TECHNOLOGIES

Table 1. Mechanical and Optical Characteristics

Photosensitive surface	C30954EH	C30955EH	C30956EH	Unit
Shape	Circular	Circular	Circular	
Useful Area	0.5	1.77	7	mm^2
Useful Diameter	0.8	1.5	3	mm
Package	TO-5	TO-5	TO-8	
Field of View α (see figure 10) [1]	110	104	132	Degrees
Field of View α' (see figure 10) [1]	125	130	150	Degrees

1. The values specified for field of view are approximate and are critically dependent on the dimensional tolerances of the packages component parts.

Table 2. Electrical Characteristics at T_A = 22 °C; at the DC reverse operating voltage V, supplied with the device[2]

Parameter	C30954EH			C30955EH			C30956EH			
	Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	Unit
Breakdown Voltage, V_{BR} [2]	300	375	475	315	390	490	325	400	500	V
Temperature Coefficient of V_R, for Constant M	-	2.4	-	-	2.4	-	-	2.4	-	V/°C
Gain (M)	-	120	-	-	100	-	-	75	-	
Responsivity @ 900 nm @ 1060 nm @ 1150 nm	 65 30 4	 75 36 5	 - - -	 55 26 4	 70 34 5	 - - -	 36 20 2.8	 45 25 3.5	 - - -	 A/W A/W A/W
Quantum Efficiency @ 900 nm @ 1060 nm @ 1150 nm	 - - -	 85 36 5	 - - -	 - - -	 85 40 5	 - - -	 - - -	 85 40 5	 - - -	 % % %
Total Dark Current, I_d	-	50	100	-	100	200	-	100	200	nA
Noise Current, i_n f=10kHz, Δf=1.0Hz	-	0.7	2	-	0.7	2	-	0.8	2.2	pA/√Hz
Capacitance, C_d	-	2	4	-	3	5	-	10	12	pF
Series resistance	-	-	15	-	-	15	-	-	15	Ω
Rise & Fall Time, R_L=50 Ω, 10%-90%-10% points	-	2	3	-	2	3.5	-	2	3.5	ns

2. A specific value of V_R is supplied with each device. When the photodiode is operated at this voltage, the device will meet the electrical characteristic limits shown above. The voltage value will be within the range of 275 to 450 volts.

Table 3 – Maximum ratings

Parameter	Min	Typical	Max	Unit
Reverse Bias Current			200	µA
Photocurrent Density, J_p, at 22 °C: Average value, continuous operation Peak value			 5 20	mA/mm^2
Forward Current, I_F, at 22°C: Average value, continuous operation Peak value (For 1 second duration, non-repetitive)			 5 50	mA
Storage Temperature	-60		+100	°C
Operating Temperature	-40		+70	
Soldering, 5 seconds, leads only			260	°C

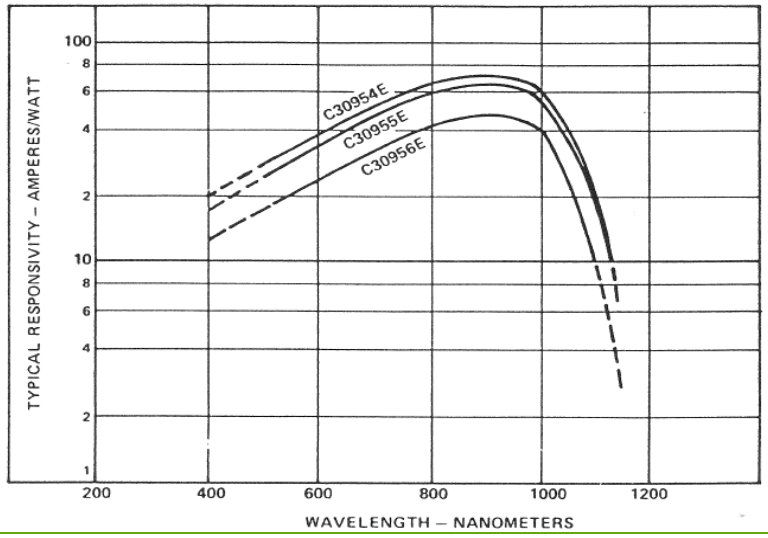


Figure 1
Typical Spectral Responsivity Characteristics

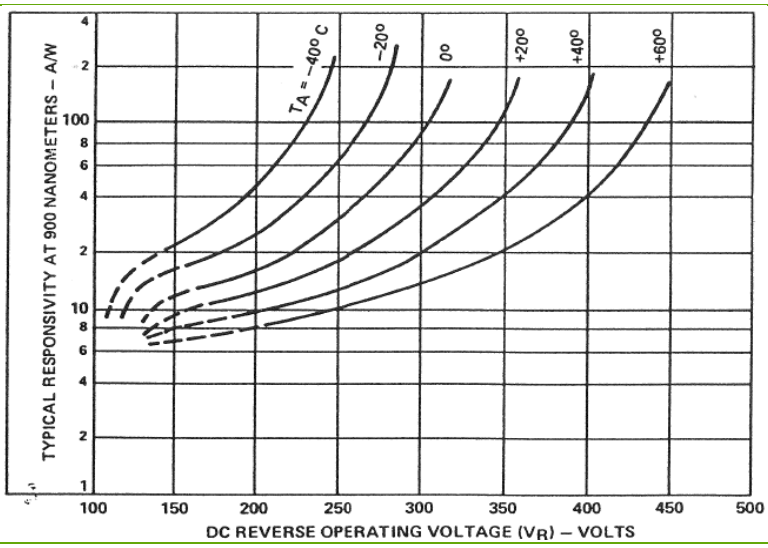


Figure 2
Typical Responsivity at 900 nm vs. Operating Voltage - C30954EH

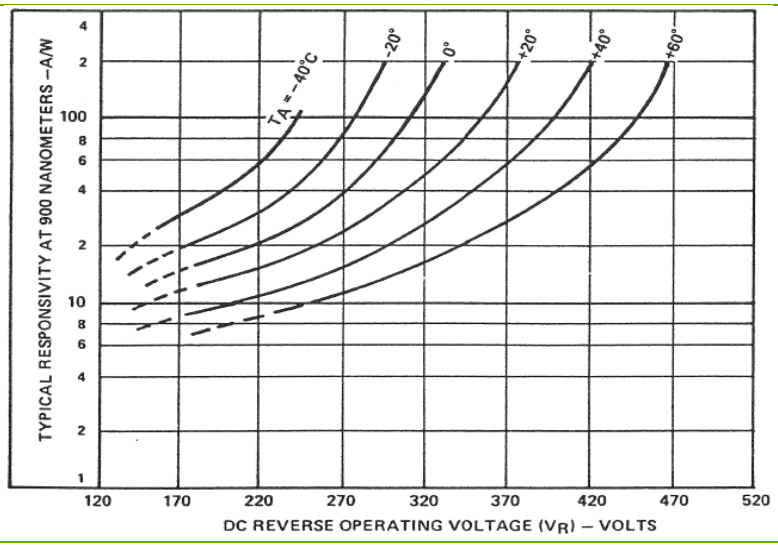


Figure 3
Typical Responsivity at 900 nm vs. Operating Voltage - C30955EH

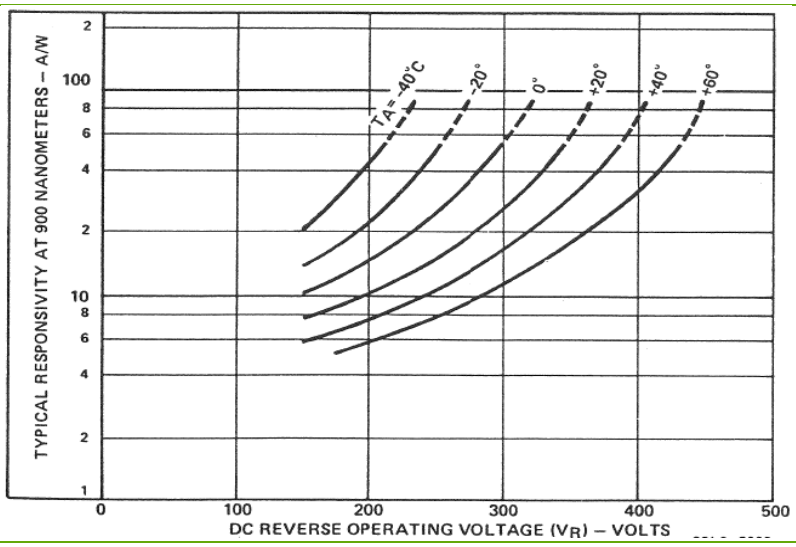


Figure 4
Typical Responsivity at 900 nm vs. Operating Voltage - C30956EH

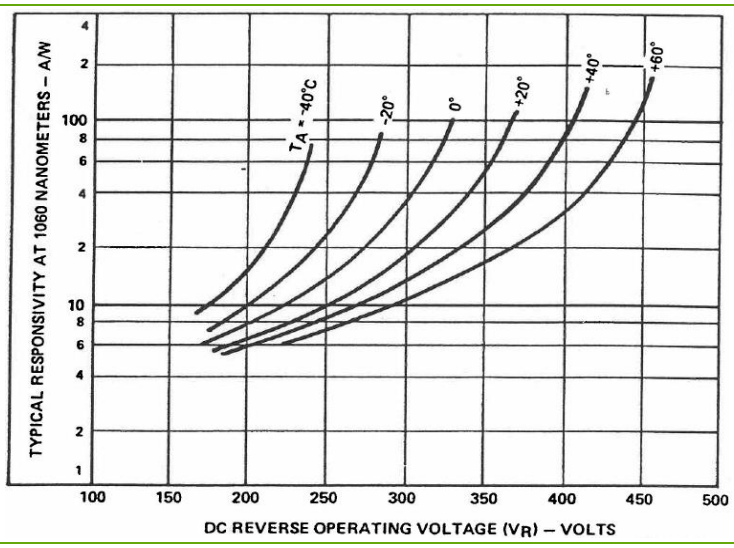


Figure 5
Typical Responsivity at 1060 nm vs. Operating Voltage - C30954EH

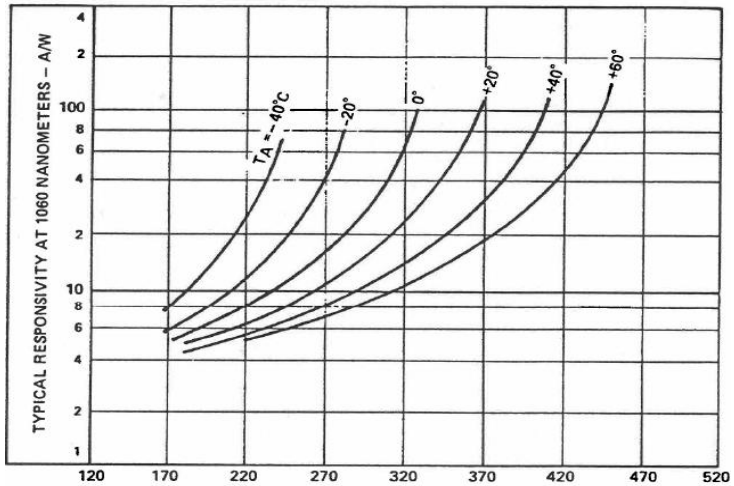


Figure 6
Typical Responsivity at 1060 nm vs. Operating Voltage - C30955EH

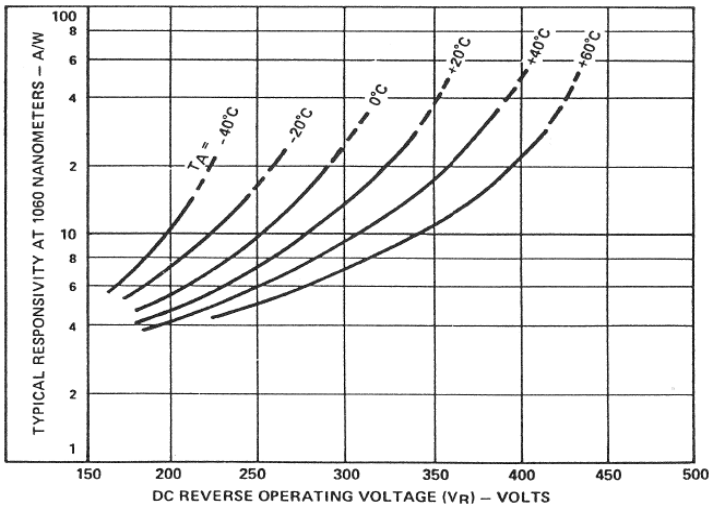


Figure 7
Typical Responsivity at 1060 nm vs. Operating Voltage - C30956EH

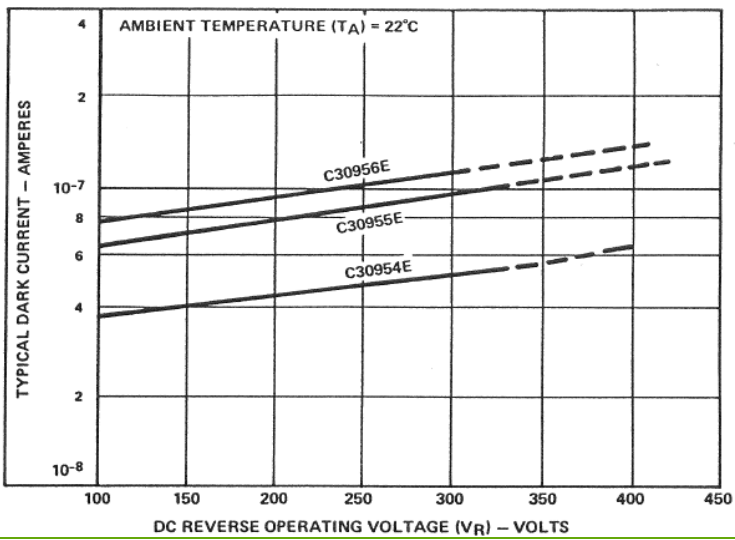


Figure 8
Typical dark current vs. Operating Voltage

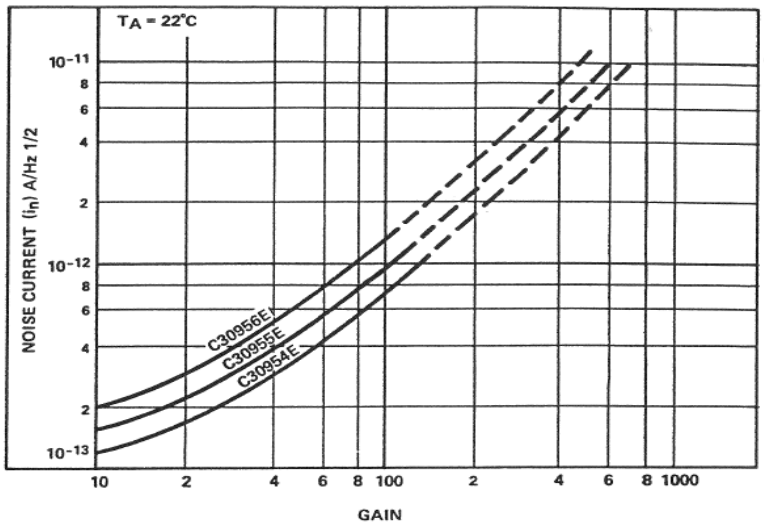


Figure 9
Typical noise current vs. Gain

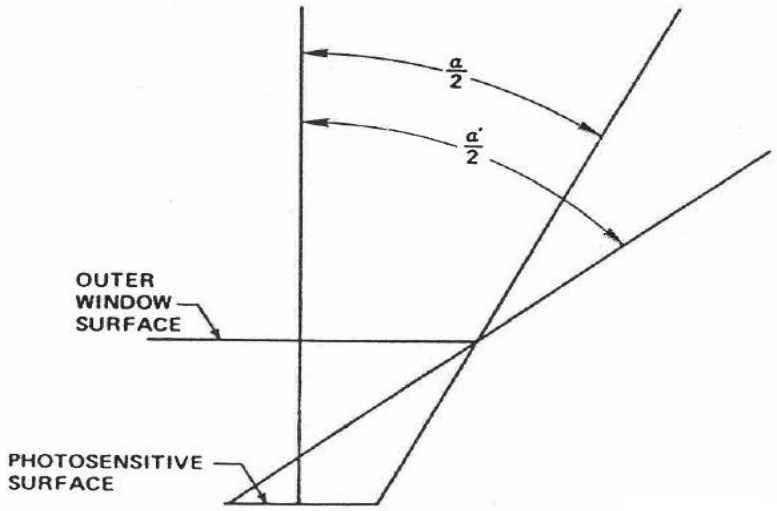


Figure 10
Definition of Half-Angle approximate field of view.

For incident radiation at angles ≤ α/2, the photosensitive surface is totally illuminated.
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For incident radiation at angles > α/2, but ≤ α' /2, the photosensitive surface is partially illuminated.

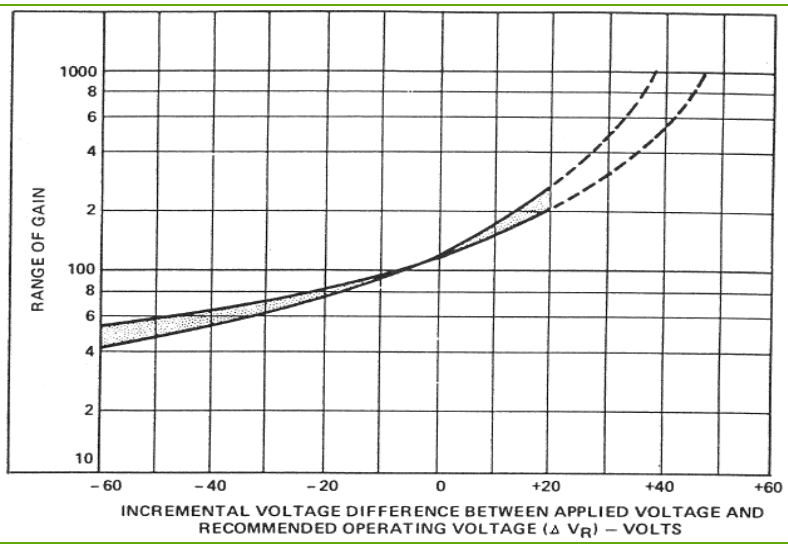

Figure 11
Variation of Gain as a Function of Difference between Actual Applied Operating Voltage and Recommended Operating Voltage - C30954EH

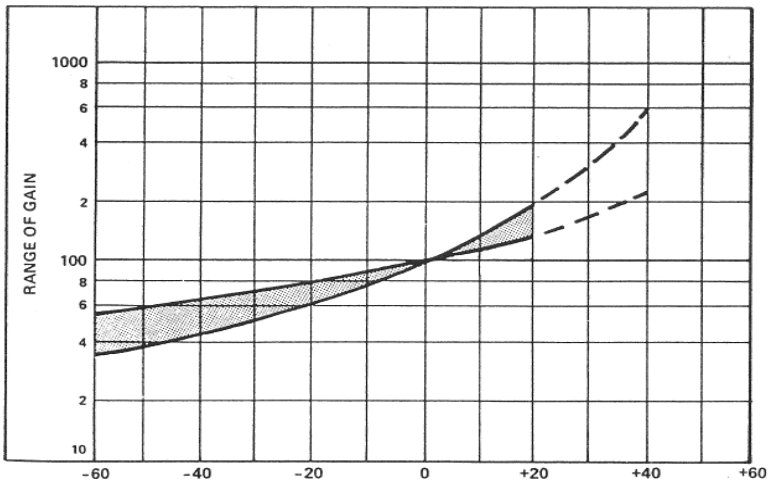

Figure 12
Variation of Gain as a Function of Difference between Actual Applied Operating Voltage and Recommended Operating Voltage - C30955EH

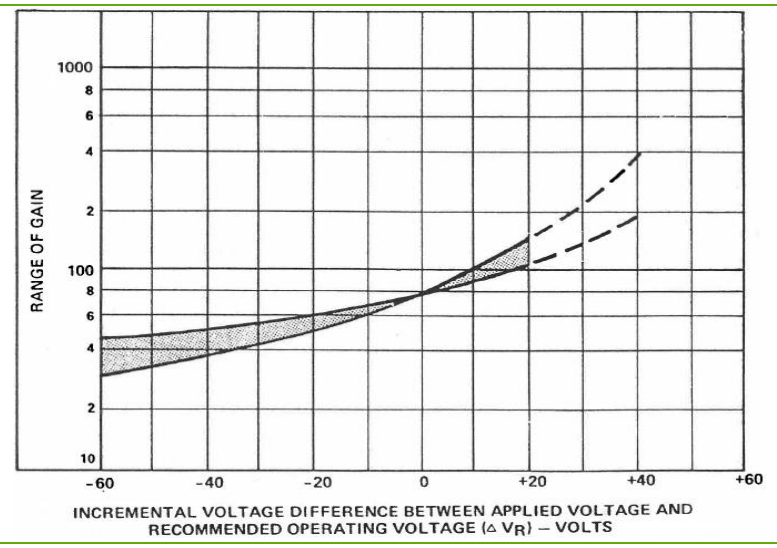

Figure 13
Variation of Gain as a Function of Difference between Actual Applied Operating Voltage and Recommended Operating Voltage - C30956EH

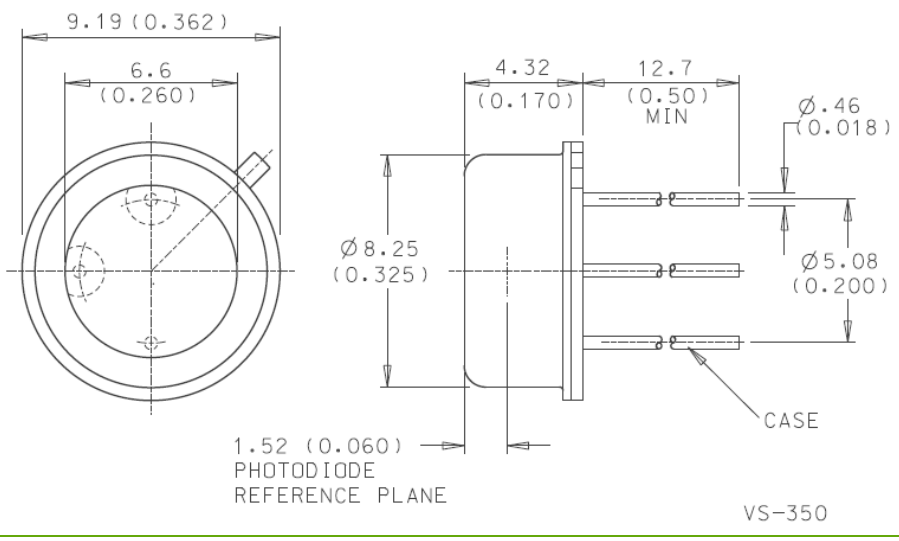

Figure 14
Dimensional Outline C30954EH, C30955EH Types

Low-Profile TO-5 Package dimensions in mm(inch)

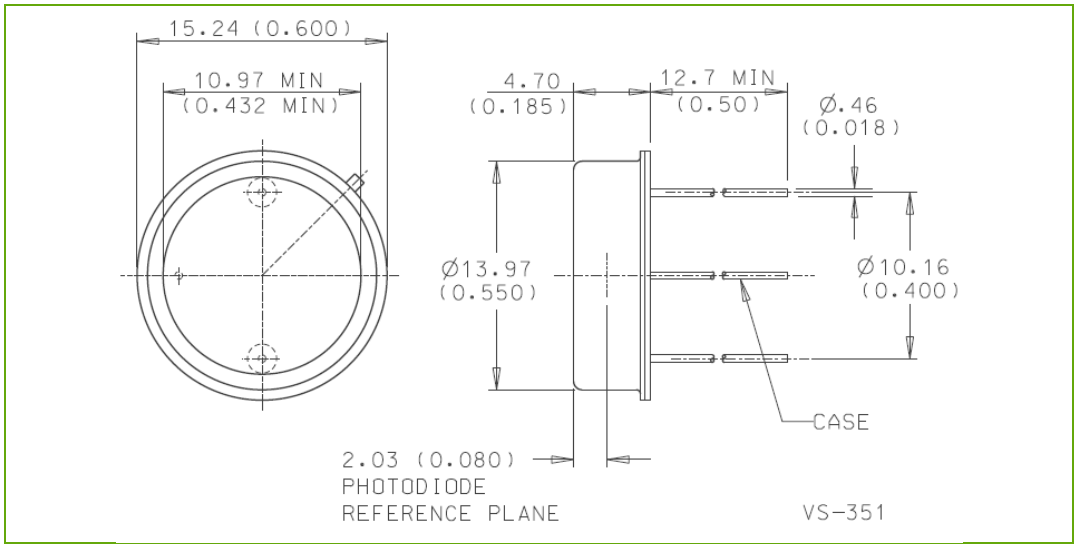

Figure 15
Dimensional Outline
C30956EH Type

Low-Profile TO-8 Package
dimensions in mm(inch)

ESD warning

APDs should only be handled at an ESD-safe work station.

RoHS Compliance

This series of APDs are designed and built to be fully compliant with the European Union Directive 2002/95EEC – Restriction of the use of certain Hazardous Substances in Electrical and Electronic equipment.

Warranty

A standard 12-month warranty following shipment applies. Any warranty is null and void if the photodiode window has been opened.

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.

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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