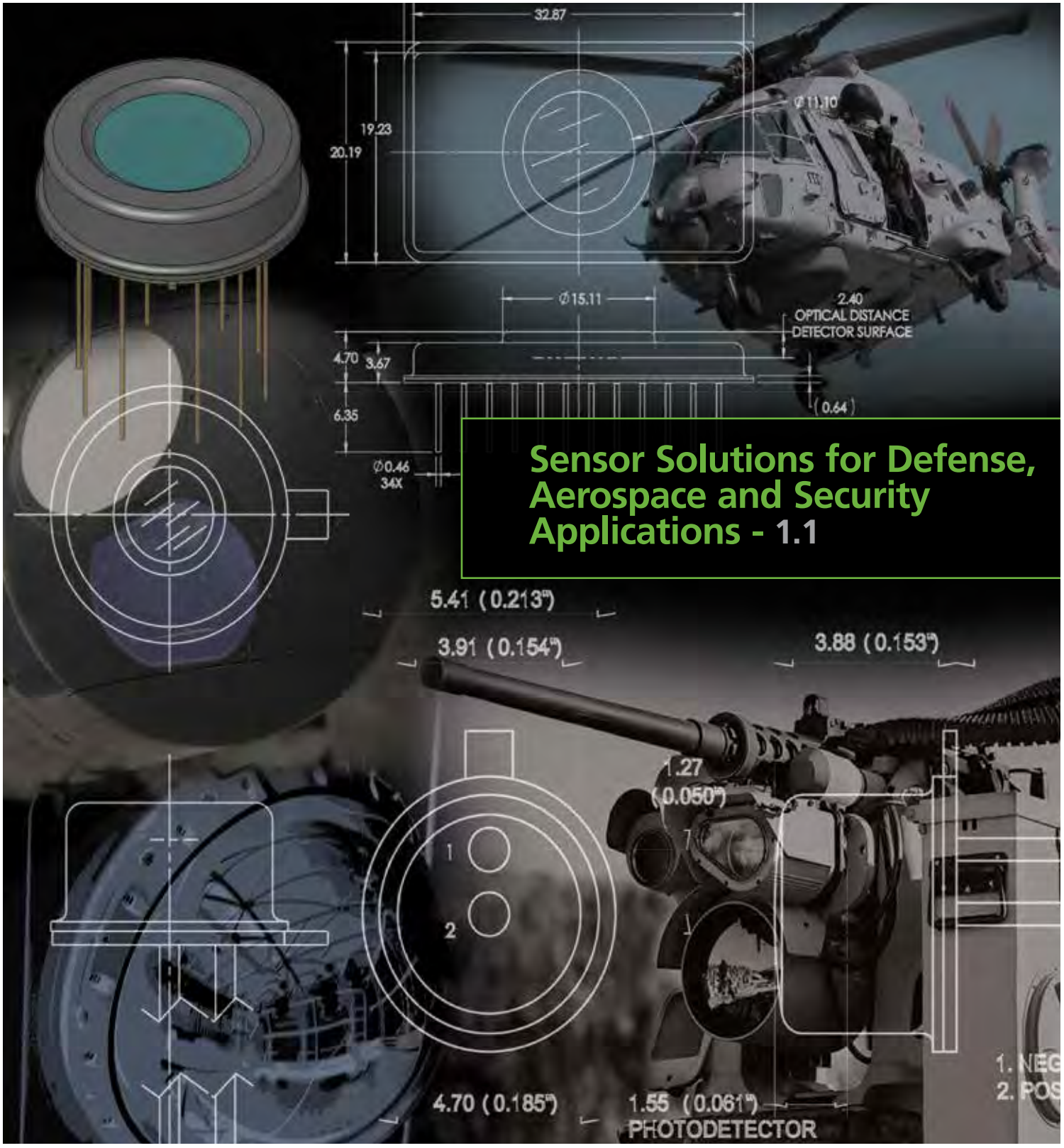
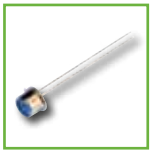


Sensor Solutions for Defense, Aerospace and Security Applications - 1.1

Photon detection for tomorrow's cutting-edge applications.

EXCELITAS TECHNOLOGIES®

Making Your World
Safer & More Secure.

At Excelitas we are sensing what you need for a safer and innovative tomorrow. From Silicon Photodiodes to InGaAs Photodiodes, Laser detection modules and Pulsed Laser Diodes, Mil Standard and Space Qualified Modules, our Defense & Aerospace Sensors Technologies are addressing your high-performance and high volume applications. You can rely on our world-class design, manufacturing and R&D facility in Montreal, Canada, with integrated wafer fab, assembly and test operation all at the same location.

Our Sensors Solutions enable:

Defense Electronics/ Optronics Systems
- Laser Range Finder (LRF)
- Target Designator
- LIDAR and LADAR
- Laser Scanning
- Obstacle Avoidance Scanner
- Laser Warning Systems (LWS)
- Training and Simulation

Next Generation Smart Munitions
- Laser Proximity Fuze
- Height of Burst Sensor
- Semi-Active Laser Seeker (SAL)
- Laser Beam Rider Transmitter
- Laser Beam Rider Receiver
- Altimeter

IMPORTANT NOTE

This catalog presents only standard products. Please contact Excelitas with your requirements to have your product designed to your specification. We have the ability to customize our products to match customer-specific requirements.

Avalanche Photodiodes APD

Silicon APDs

Applications

- Laser Range Finder
- Target Designator
- Munitions Laser Guidance
- Laser Altimeter
- Laser Scanning
- LIDAR and LADAR
- Laser Alert
- Training & Simulation

Features and Benefits

- Low noise
- High gain
- High quantum efficiency
- Built-in TE-cooler option
- Various optical input options
- Customization available upon request

Product Description

These rear entry "reach-through" silicon APDs offer the best compromise in terms of cost and performance for applications requiring high speed and low noise photon detection from 400 nm up to 1100 nm. They feature low noise, high quantum efficiency and high gain while maintaining reasonably low operating voltage. The active area varies from 0.5 mm to 3 mm to accommodate a large variety of applications.

The "S" series of the C30902 family of APDs can be used in either their normal linear mode ($V_R < V_{BR}$) or in their Geiger mode ($V_R > V_{BR}$) as a photon counters. This series is particularly well-suited for ultra-sensitive photon measurements. Precise temperature control can be achieved with a thermo-electric cooler which can be used to improve noise and responsivity or to maintain constant responsivity over a wide range of ambient temperature.

These APDs can also be incorporated into a hermetically-sealed TO-8 package with ultra-low noise preamplifier (C30659 series APD receivers) and thermo-electric cooler (LLAM series receivers) for optimum signal to noise performance. See page 15 for more information.

Technical Specification

Avalanche Photodiodes – Silicon APDs

Unit	Active Diameter mm	Capacitance pF	Rise/Fall Time ns	Dark Current nA	Breakdown Voltage min V	Breakdown Voltage max V	Temp. Coefficient V/° C	Typical Gain	Responsivity 830 nm A/W	Responsivity 900 nm A/W	Responsivity 1060 nm A/W	NEP fW / √Hz	Package
C30817EH	0.8	2	2	50	300	475	2.2	120	-	75		1	TO-5
C30884E	0.8	4	1	100	190	290	1.1	100	-	63	8	13	TO-5
C30902BH	0.5	1.6	0.5	15	185	265	0.7	150	77	60	-	3	Ball lens TO-18
C30902BSTH	0.5	1.6	0.5	15	185	265	0.7	150	77	60	-	3	ST receptacle
C30902EH	0.5	1.6	0.5	15	185	265	0.7	150	77	60	-	3	TO-18, flat window
C30902EH-2	0.5	1.6	0.5	15	185	265	0.7	150	77	60	-	3	TO-18, built-in 905 nm filter
C30902SH	0.5	1.6	0.5	15	185	265	0.7	250	128	108	-	0.9	TO-18, flat window
C30902SH-2	0.5	1.6	0.5	15	185	265	0.7	250	128	108	-	0.9	TO-18, built-in 905 nm filter
C30916EH	1.5	3	3	100	315	490	2.2	80	-	50	12	20	TO-5
C30921EH	0.25	1.6	0.5	15	185	265	0.7	150	77	60	-	3	TO-18, flat window
C30921SH	0.25	1.6	0.5	15	185	265	0.7	250	128	108	-	0.9	TO-18, light pipe
C30954EH	0.8	2	2	50	300	475	2.4	120	-	75	36	13	TO-5
C30955EH	1.5	3	2	100	315	490	2.4	100	-	70	34	14	TO-5
C30956EH	3	10	2	100	325	500	2.4	75	-	45	25	25	TO-8

Product Table

Silicon APD – TE-Cooled

Unit	Active Diameter mm	Active Area mm²	Total Capacitance pF	Rise/Fall Time ns	Dark Current nA	Breakdown Voltage min V	Breakdown Voltage max V	Temperature Coefficient	Typical Gain	Responsivity 830 nm A/W	Responsivity 900 nm A/W	Responsivity 1060 nm A/W	Noise Current pA / √Hz	Package
C30902SH-TC	0.5	0.2	1.6	0.5	2	225	-	0.7	250	128	108	-	0.04	TO-66 flange
C30902SH-DTC	0.5	0.2	1.6	0.5	1	225	-	0.7	250	128	108	-	0.02	TO-66 flange
C30954EH-TC	0.8	0.5	2	2	50	300	475	2.4	120	-	75	-	0.2	TO-66 flange
C30955EH-TC	1.5	1.8	3	2	100	315	490	2.4	100	-	70	-	0.2	TO-66 flange
C30956EH-TC	3	7	10	2	100	325	500	2.4	75	-	45	-	0.2	TO-66 flange

NOTE: TC stands for single stage cooler, operating temperature 0° C
NOTE: DTC stands for double stage cooler, operating temperature -20° C

Figure 1

TO-66 Flange*

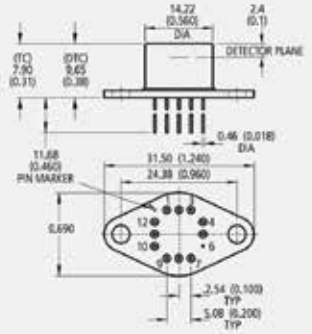


Figure 2

TO-5 Package*

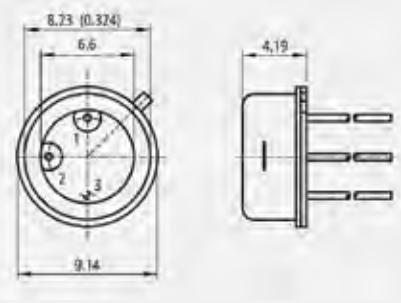


Figure 3

TO-8 Package*

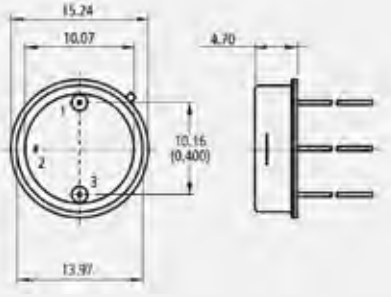


Figure 4

TO-18 Package*

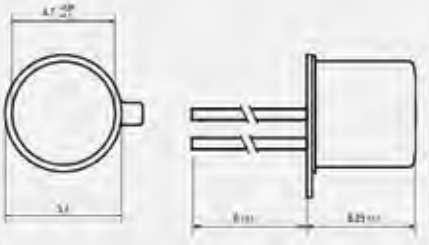


Figure 5

Ball Lens TO-18*

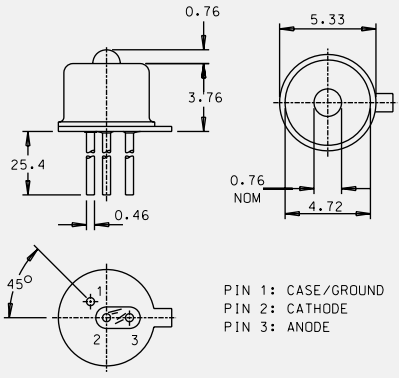


Figure 6

TO-18 Built-in 905 nm Filter*

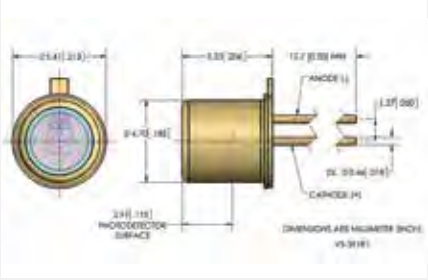
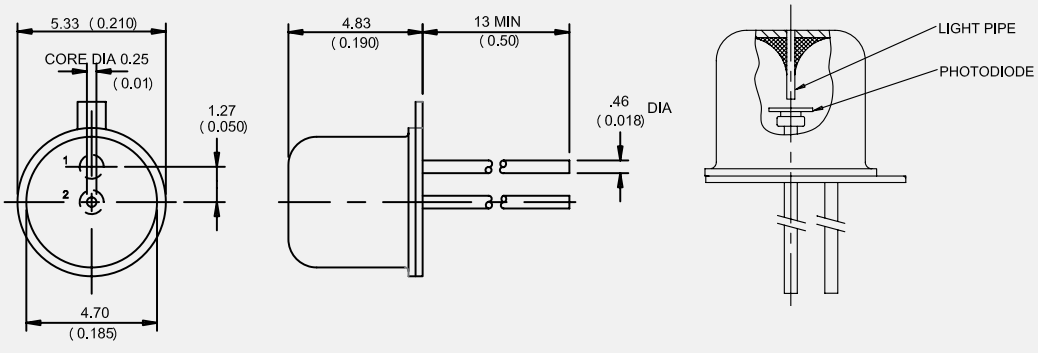


Figure 7

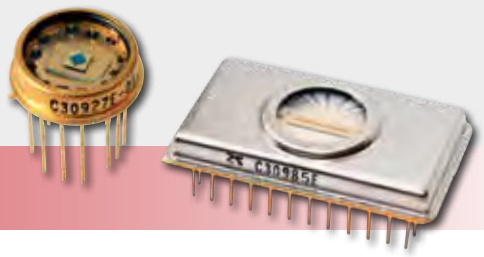
TO-18 Light Pipe*



*Note: Package dimensions for indication only. Exact package dimensions can be found on products datasheets.

Avalanche Photodiodes

Multi-Elements



Si APD Arrays and Quadrants

Applications

- Laser Spot Tracking
- Triangulation
- Interferences Fringes
- Interferonetry
- Position Sensing
- Munitions Guidance

Features and Benefits

- High quantum efficiency
- Hermetically-sealed packages
- Monolithic chip with minimal dead space between elements
- Specific tailored wavelength response
- RoHS compliant
- Customization available upon request

Product Description

The C30927 series of quadrant Si Avalanche Photodiode and the C30985E multi-element APD array utilize the double-diffused "reach-through" structure, which provides ultra high sensitivity. The C30927 quadrant structure has a common avalanche junction, with separation of the quadrants achieved by segmentation of the light entry p+ surface opposite the junction. With this design, there is no dead space between the elements and therefore no loss of response at boresight.

The C30927 series of quadrant Si Avalanche Photodiode and the C30985E multi-element APD array utilize the double-diffused "reach-through" structure, which provides ultra-high sensitivity. Based on a common avalanche junction, with separation of the quadrants achieved by segmentation of the light entry p+ surface opposite the junction. With this design, there is no dead space between the elements and therefore no loss of response at boresight.

The C30638EH and C30985E are 20 and 25 element monolithic linear APD array having a high inter-electrode resistance with small dead space between the elements. Packages have a common ground and bias with a separate lead for each element output.

Product Table

Avalanche Photodiodes – Si APD Arrays

Part Number	Number of Elements	Photo Sensitive Area	Responsivity	Dark Current per Element	Spectral Noise Current	Capacitance @100 KHz	Response Time	NEP	Vop
Unit	mm	mm	A/W	nA	pA/√Hz	pF	ns	fW/√Hz	V
C30927EH-01	4	1.5 ø	15 @ 1064 nm	25	0.5	1	3	33 @ 1064 nm	275 - 425
C30927EH-02	4	1.5 ø	62 @ 900 nm	25	0.5	1	3	16 @ 900 nm	275 - 425
C30927EH-03	4	1.5 ø	55 @ 800 nm	25	0.5	1	3	9 @ 800 nm	275 - 425
C30638EH	20	10 x 1.25 (60µm dead space)	16 @ 633 nm	1	0.1	2	2	0.1 @ 633 nm	180 - 350
C30985E	25	7.5 x 0.3 (75µm dead space)	31 @ 900 nm	1	0.1	0.5	2	3 @ 900 nm	250 - 425

Figure 1

C30927 Series*

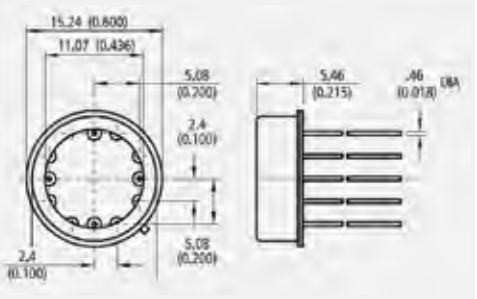
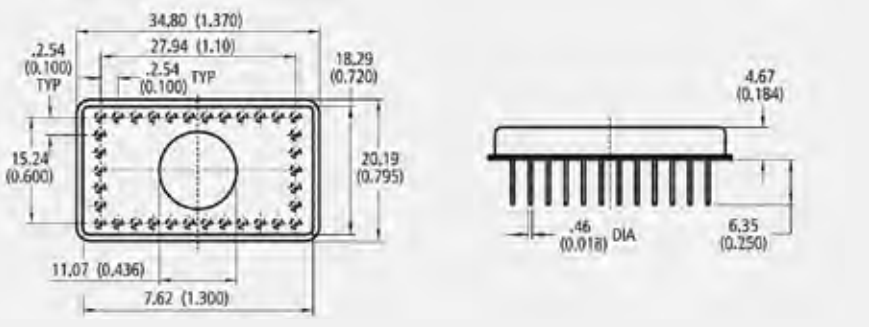


Figure 2

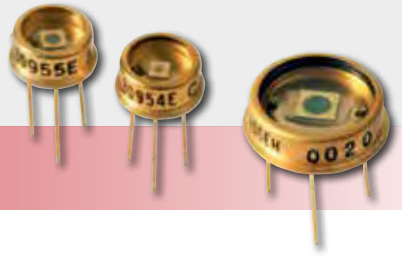
C30985E*



*Note: Package dimensions for indication only. Exact package dimensions can be found on products datasheets.

Avalanche Photodiodes

Optimized for YAG



1064 nm NIR Enhanced Si APDs

Applications

- Range Finding
- LIDAR (Light Detection And Ranging)
- YAG Laser Detection
- Target Designator

Features and Benefits

- High quantum efficiency at 1064 nm
- Fast response time
- Wide operating temperature range
- Low capacitance
- Hermetically-sealed packages
- RoHS compliant
- Customization available upon request

Product Description

The C30954EH, C30955EH, and C30956EH are general purpose silicon avalanche photodiodes made using a double-diffused "reach-through" structure. The design of these photodiodes are such that their long wave response (i.e. >900 nm) has been enhanced and these APDs have quantum efficiency of up to 40 % at 1064 nm. At the same time, the diodes retain the low noise, low capacitance, and fast rise and fall times characteristics.

To help simplify many design needs, these APDs are also available in Excelitas' high-performance hybrid preamplifier module type C30659 series, as well as the preamplifier and TE cooler incorporated module type LLAM series. In addition, these APDs are also available with built-in thermo-electric cooler for easier temperature control. Please refer to Page 15 in this catalog.

Product Table

Si APDs – NIR Enhanced

Part Number	Photo Sensitive Diameter	Respon-sivity @ 1064 nm	Dark Current	Spectral Noise Current	Capacitance @ 100 KHz	Response Time	NEP @ 1060 nm	Vop Range
Unit	mm	A/W	nA	pA/√Hz	pF	ns	fW/√Hz	V
C30954EH	0.8	36	50	0.5	2	2	14	275 - 425
C30955EH	1.5	34	100	0.5	3	2	15	275 - 425
C30956EH	3.0	25	100	0.5	10	2	20	275 - 425

Product Table

Silicon APD – TE-Cooled

	Active Diameter	Active Area	Total Capacitance	Rise/Fall Time	Dark Current	Breakdown Voltage min	Breakdown Voltage max	Temperature Coefficient	Typical Gain	Responsivity 830 nm	Responsivity 900 nm	Responsivity 1060 nm	Noise Current	
Unit	mm	mm^2	pF	ns	nA	V	V			A/W	A/W	A/W	pA/√Hz	Package
C30954EH-TC	0.8	0.5	2	2	50	300	475	2.4	120	-	75	-	0.2	TO-66 flange
C30955EH-TC	1.5	1.8	3	2	100	315	490	2.4	100	-	70	-	0.2	TO-66 flange
C30956EH-TC	3	7	10	2	100	325	500	2.4	75	-	45	-	0.2	TO-66 flange

TC stands for single stage cooler, operating temperature 0° C. See page 5 for TO-66 flange package drawing.

Graph 1

Spectral Responsivity Characteristics

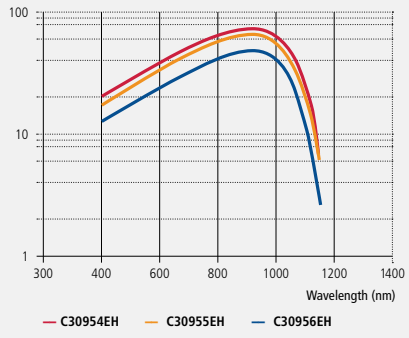


Figure 1

C30954EH, C30955EH*

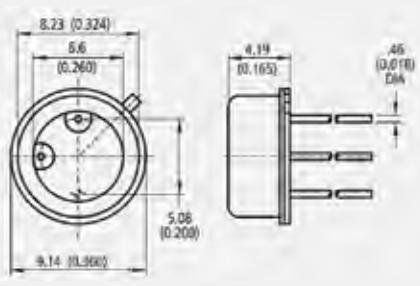
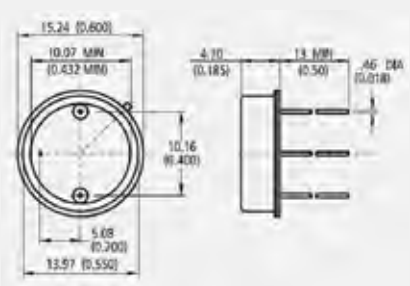


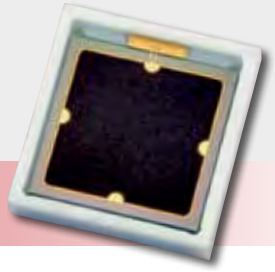
Figure 2

C30956EH*



*Note: Package dimensions for indication only. Exact package dimensions can be found on products datasheets.

Avalanche Photodiode



Large Area Si-APDs – UV-Enhanced APDs

Applications

- Nuclear Medicine
- Fluorescence Detection
- High Energy Physics
- Medical Imaging
- Radiation Detection
- Particle Physics
- Instrumentation
- Environmental Monitoring

Features and Benefits

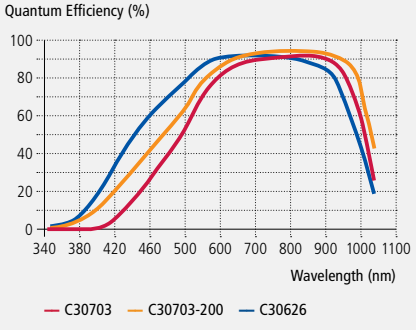
- High quantum efficiency
- Low dark currents
- Easy coupling to scintillator crystals
- Immunity to electromagnetic fields
- Custom packaging available
- Excellent timing resolution
- RoHS compliant
- Customization available upon request

Product Description

The C30739ECERH Silicon Avalanche Photodiode (APD) is intended for use in a wide variety of broadband low light level applications covering the spectral range from below 400 to over 700 nanometers. It has low noise, low capacitance and high gain. It is designed to have an enhanced short wavelength sensitivity, with quantum efficiency of 60 % at 430 nm.
The standard ceramic carrier package allows for easy handling and coupling to scintillating crystals such as LSO and BGO. Combined with the superior short wavelength responsivity, it makes this APD ideal in demanding applications such as Positron Emission Tomography (PET).
The C30626FH and C30703FH series are large area Si APDs in flat pack packages for either direct detection or easy coupling to scintillator crystals.
The C30626 uses a standard reach through structure and has peak detection at about 900 nm. The C30703 is enhanced for blue wavelength response and has peak quantum efficiency at ~ 530 nm. These APDs are packaged in a square flat pack with or without windows or on ceramics. The no-window devices can detect direct radiation of X-rays and electrons at the energies listed, and the windowed packages are best for easy scintillator coupling.

Graph 1

Quantum Efficiency vs. Wavelength



Graph 2

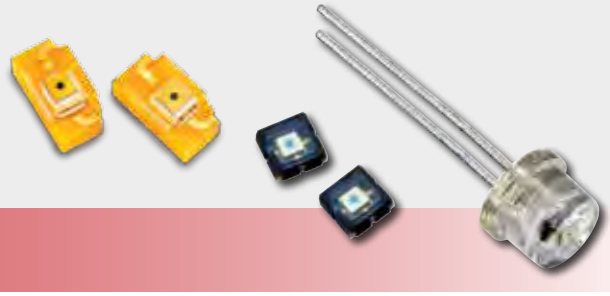
Quantum Efficiency vs. Wavelength

Product Table

Large Area Si-APDs – UV-Enhanced APDs

Part Number	Photo Sensitive Diameter	Responsivity	Dark Current	Spectral Noise Current	Capacitance @ 100 KHz	Response Time	NEP	Vop Range
Unit	mm	A/W	nA	pA/√Hz	pF	ns	fW/√Hz	V
C30626FH	5 x 5	22 @ 900 nm	250	0.5	30	5	23 @ 900 nm	275 - 425
C30703FH	10 x 10	16 @ 530 nm	10	0.7	100	5	40 @ 530 nm	275 - 425
C30703FH-200	10 x 10	16 @ 530 nm	10	0.7	60	5	40 @ 530 nm	275 - 425
C30739ECERH	5.6 x 5.6	20 @ 430 nm	50	1.4	60	2	-	275 - 425
C30739ECERH-2	5.6 x 5.6	52 @ 430 nm	50	2	60	2	-	275 - 425

Avalanche Photodiodes



Left: C30737CH Series
Center: C30737LH Series
Right: C30737PH Series

C30737 High Speed, Low Voltage APD

Applications

- Laser Range Finding 600 to 950 nm
- Training & Simulation
- Height of Burst
- Laser Proximity Sensor

Features and Benefits

- Optimized versions for peak responsivity at 900 nm or high bandwidth operation
- Standard versions with 500 and 230 µm active diameter
- Various package types: hermetic TO, plastic TO, SMD top-and side-looking
- High gain at low bias voltage
- Low breakdown voltage
- Fast response, t_R ~ 300 ps
- Low noise, in ~ 0.2 pA/√Hz
- RoHS compliant
- Customization available upon request

Product Description

The Excelitas C30737 series silicon APDs provide high responsivity between 500 nm and 1000 nm as well as extremely fast rise times at all wavelengths, with a frequency response above 1 GHz for bandwidth-optimised versions. The C30724, as a low gain APD, can be operated at a fixed voltage without the need for temperature compensation.

Standard versions of the 737 are available in three active area sizes: 0.23, 0.3 and 0.5 mm diameter. They are offered in the traditional hermetic TO housing ("E"), in cost-effective plastic through-hole T-1¾ (TO-like, "P") packages, in leadless ceramic carrier (LCC, "L") top-looking package and laminated leadless ceramic (LLC, "C") side-looking package for surface mount use. All listed varieties are ideally suited for high-volume, low cost applications.

Customization of these APDs is offered to meet your design challenges. Operating voltage selection and binning or specific wavelength filtering options are among many of the application-specific solutions available.

Product Table

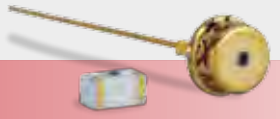
C30737 Epitaxial Silicon APD – C30724 Low-Gain APD

Part Number	Package	Optical Bandpass Filter	Active Area Diam.	Peak Sensitivity Wavelength	Breakdown Voltage		Temp. Coeff. Of V_{OP}, for Constant M	Gain@ λ_{peak}	Responsivity @ λ_{peak}	Total Dark Current (Bulk + Surface)		Noise Current, (f = 10 kHz, Δf=1 Hz)	Capacitance	Rise & Fall Time, (RL = 50 Ω, 10 % - 90 % -10 % Points)
				typ	min	max	typ	typ	typ	typ	max		typ	typ
		design	design	λ_{peak}	V_{BR}	V_{BR}		M	M	I_D	I_D		C_D	
Unit		nm	µm	nm	V	V	V/°C			nA	nA	pA/√Hz	pF	ns
C30724EH	TO	-	500	920	-	350	-	15	8.5	20	40	0.1	1.0	5
C30724PH	T-1¾	-	500	920	-	350	-	15	8.5	20	40	0.1	1.0	5
C30737EH-230-80	TO	-	230	800	120	200	0.5	100	50	0.05	0.5	0.1	1.0	0.2
C30737PH-230-80	T-1¾	-	230	800	120	200	0.5	100	50	0.05	0.5	0.1	1.0	0.2
C30737LH-230-80	LCC	-	230	800	120	200	0.5	100	50	0.05	0.5	0.1	1.0	0.2
C30737LH-230-81	LCC	635	230	635	120	200	0.5	100	35	0.05	0.5	0.1	1.0	0.2
C03737LH-230-83	LCC	650	230	650	120	200	0.5	100	35	0.05	0.5	0.1	1.0	0.2
C30737CH-230-80	LLC	-	230	800	120	200	0.5	100	50	0.05	0.5	0.1	1.0	0.2
For the remaining 737 family APDs only a generic package and filter part number will be shown, to show the different APD chip characteristics, please contact us for more information.														
C30737*X*H-300-7*X*	LLC, LCC	635, 650	300	800	110	160	-	100	50	0.1	1	0.1	0.7	0.5
C30737*X*H-500-8*X*	all	635, 650	500	800	120	200	0.5	100	50	0.1	1	0.1	2.0	0.9
C30737*X*H-230-9*X*	all	905	230	900	180	260	1.3	100	60	0.05	0.5	0.1	0.6	0.9
C30737*X*H-500-9*X*	all	905	500	900	180	260	1.3	100	60	0.1	1	0.1	1.0	0.9

Electrical Characteristics at $T_{Ambient}$ = 22 °C; at operating voltage, V_{op}

Avalanche Photodiodes

For Eye-Safe Laser Ranging



InGaAs APDs

Applications

- Eye-safe Laser Range Finding
- Optical Time-Domain Reflectometer (OTDR)
- Optical Communication Systems
- 1550 nm, Eye-safe, LIDAR/LADAR

Features and Benefits

- Low noise
- High gain and quantum efficiency (QE)
- Built-in TE-cooler option
- Various optical input options
- Customization available upon request

Product Description

The C30644, 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, with standard active areas up to 200 µm in diameter. They are optimized for use at a wavelength of 1550 nm, ideally suitable for use in eye-safe laser range finding systems.

Thes APDs can be supplied in a hermetically-sealed TO-18 package, with the chip mounted close to the window to allow easy interfacing with the optical system, on a ceramic carrier or on an SMD in leadless ceramic carrier (LCC). The C30645 and C30662 series APD are offered in the C30659 series of APD receivers with low noise transimpedance amplifier, as well as built-in thermo-electric cooler (the LLAM series). For these modules, refer to page 15 of this catalog. Other custom package are also available on request.

Figure 1

Ceramic Carrier*

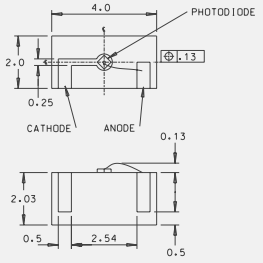


Figure 2

TO-18 Package*

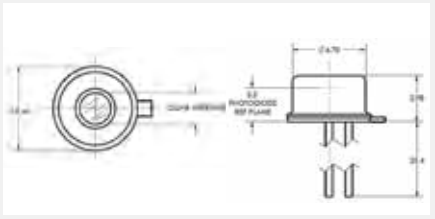


Figure 3

SMD LCC Package*

*Note: Package dimensions for indication only. Exact package dimensions can be found on products datasheets.

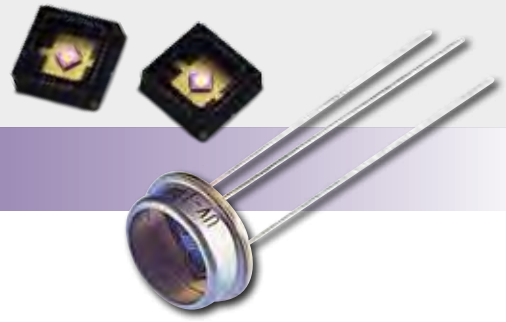
Product Table

InGaAs APD

Unit	Active Diameter µm	Capacitance pF	B_W MHz	Dark Current nA	Breakdown Voltage min V	Breakdown Voltage max V	Temperature Coefficient V/°C	Typical Gain	Responsivity 1550 nm A/W	NEP fW/ √Hz	RoHS Compliance	Package
C30644ECERH	50	0.6	2000	25	40	90	0.14	10	9.3	15	Yes	Ceramic carrier
C30644EH	50	0.6	2000	25	40	90	0.14	10	9.3	15	Yes	TO-18
C30645ECERH	80	1.25	1000	35	40	90	0.14	10	9.3	25	Yes	Ceramic carrier
C30645E	80	1.25	1000	35	40	90	0.14	10	9.3	25	No	TO-18, Small aperture, Silicon
C30645EH	80	1.25	1000	35	40	90	0.14	10	9.3	25	Yes	TO-18, Small aperture, Silicon
C30645EH-1	80	1.25	1000	35	40	90	0.14	10	9.3	25	Yes	TO-18, Large aperture, Glass
C30645L	80	1.25	1000	35	40	90	0.14	10	9.3	25	Yes	SMD LLC
C30662ECERH	200	2.5	800	70	40	90	0.14	10	9.3	100	Yes	Ceramic carrier
C30662ECERH-1	200	2.5	800	70	40	90	0.14	10	9.3	100	Yes	Ceramic carrier
C30662E	200	2.5	800	70	40	90	0.14	10	9.3	100	No	TO-18, Small aperture, Glass
C30662EH	200	2.5	800	70	40	90	0.14	10	9.3	100	Yes	TO-18, Large aperture, Glass
C30662EH-1	200	2.5	800	70	40	90	0.14	10	9.3	100	Yes	TO-18, Large aperture, Glass
C30662EH-3	200	2.5	800	70	40	90	0.14	10	9.3	100	Yes	TO-18, Small aperture, Glass

NOTE: The "-1" version of the C30662 series have a Vbr-Vop of >4V. Glass material is transparent for visible and IR wavelengths, while Silicon blocks visible light up to about 1.1µm.

PIN Photodiodes



InGaAs and Si PIN Diodes

Applications

- Beam Rider Receiver
- Range Finding
- Training & Simulation
- Height of Burst
- Laser Proximity Sensor

Features and Benefits

- High speed
- High responsivity
- Hermetically-sealed
- Large area available
- High shunt resistance, low dark current
- Customization available upon request

Product Description

Silicon PIN photodiodes are available in a wide variety of active areas to accommodate a large range of applications. The PIN structure allows high quantum efficiency and fast response for detection of photons in the 400 nm to 1100 nm range.

The C30741 provides fast response and good quantum efficiency in the spectral range between 300 nm to 1100 nm. Designed for high-speed, high-volume production and cost-sensitive applications, these photodiodes are offered in plastic TO-style packages with a visible blocking filter option.

Our UV series are high quality Si PIN photodiodes in hermetically-sealed TO packages designed for the 220 nm to 1100 nm wavelength region with enhanced operation in the UV range. Low noise detection is achieved by operating the UV series in photovoltaic mode (0 V bias).

The InGaAs PIN detectors provide high quantum efficiency from 800 nm to 1700 nm. They feature low capacitance for extended bandwidth, high resistance for high sensitivity, high linearity, and uniformity within 2 % across the detector active area.

Product Table

InGaAs PIN, High Speed, Peak Wavelength at 1550 nm

	Active Diameter	Responsivity Peak	Capacitance	B_W	Dark Current	Breakdown Voltage	Operating Voltage	
Unit	µm	A/W	pF	GHz	nA	V	V	Package
C30617BH	100	0.95	0.8	3.5	<1	100	5	TO-18, ball lens
C30617BFCH	100	0.95	0.8	3.5	<1	100	5	TO-18, FC receptacle
C30617BSCH	100	0.95	0.8	3.5	<1	100	5	TO-18, SC receptacle
C30617BQC-04-XX	100	0.95	0.8	3.5	<1	100	5	Pigtailed TO-18
C30617GH	100	0.95	0.8	3.5	<1	100	5	TO-18
C30617ECERH	100	0.95	0.6	3.5	<1	100	5	Ceramic carrier
C30617L-100	100	0.95	0.6	3.5	<1	100	5	SMT
C30743GH	200	0.95	0.6	3.5	<1	100	5	TO-18
C30618BFCH	350	0.95	4	0.75	1	100	5	TO-18, FC receptacle
C30618GH	350	0.95	4	0.75	1	100	5	T0-18
C30618ECERH	350	0.95	4	0.75	1	100	5	Ceramic carrier
C30618L-350	350	0.95	4	0.75	1	100	5	SMT

NOTE: Different fiber core diameter can be ordered, please contact us for more information.

Product Table

InGaAs and Si PIN, Large Area, Peak Wavelength at 1550 nm

Unit	Active Diameter mm	Responsivity Peak A/W	Capacitance pF	Shunt Resistance Mega Ohm	B_W MHz	Dark Current nA	Breakdown Voltage V	Operating Voltage V	Package
C30619GH	0.5	0.95	40	250	75	5	80	0-10	TO-18
C30641EH-TC	1	0.95	8	50	350	1	80	0-5	TO-8, flange, TE-cooled
C30641EH-DTC	1	0.95	40	50	75	5	80	0-5	TO-8, flange, dual TE
C30641GH	1	0.95	40	50	75	5	80	0-5	TO-18
C30642GH	2	0.95	150	25	20	10	50	0-5	TO-5
C30665GH	3	0.95	200	10	3	25	50	0-5	TO-5
C30723GH	5	0.95	950	5	3	-	50	0-5	TO-5

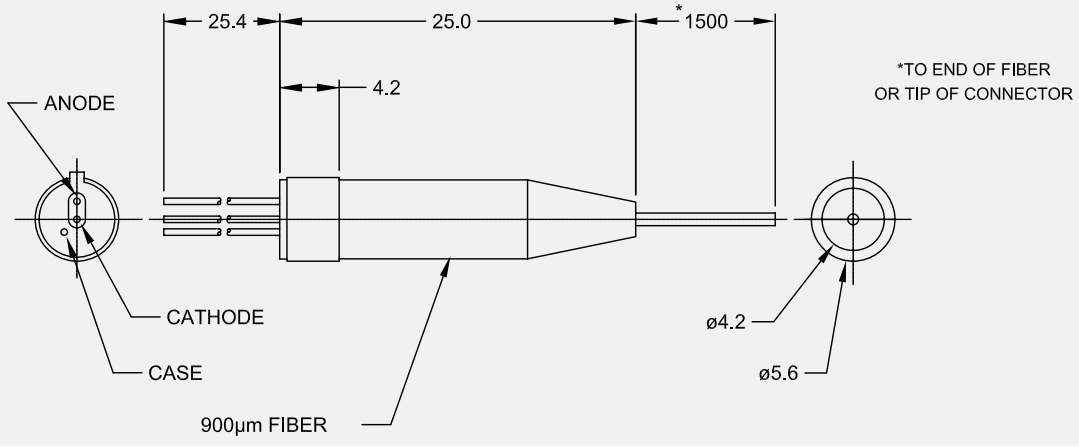
Product Table

Silicon PIN

Unit	Active Diameter mm	Active Area mm^2	Responsivity Peak A/W	Peak Wavelength nm	Capacitance pF	Rise/Fall Time ns	Dark Current nA	Shunt Resistance MΩ	Breakdown Voltage V	Operating Voltage V	Package
C30741PFH-15S-8N	1.5 x 1.5	2.25	0.47	800	11	2	0.05	-	300	10	Plastic T-1¾ through-hole
C30741PFH-15S	1.5 x 1.5	2.25	0.47	800	11	2	0.05	-	300	10	T-1¾ visible blocking
C30807EH	1	0.8	0.6	900	2.5	5	10	-	>100	45	TO-18
C30808EH	2.5	5	0.6	900	6	8	30	-	>100	45	TO-5
C30822EH	5	20	0.6	900	17	10	50	-	>100	45	TO-8
C30809EH	8	50	0.6	900	35	15	70	-	>100	45	TO-8
C30810EH	11	100	0.6	900	70	20	300	-	>100	45	TO-36
C30971EH	0.5	0.2	0.5	830	1.6	0.5	10	-	>200	100	TO-18
FFD-100H	2.5	5.1	0.6	850	8.5	3.5	5	-	>125	15	TO-5
FFD-200H	5	20	0.6	850	30	5	10	-	>125	15	TO-5
FND-100GH	2.5	5.1	0.64	920	8.5	<1	10	-	150	100	TO-5
FND-100QH	2.5	5.1	0.64	920	8.5	<1	10	-	150	100	TO-5, response down to 200 nm
UV-040BQH	1	0.81	0.62	900	25	-	-	>500	-	0	TO-5, response down to 200 nm
UV-100BQH	2.5	5.1	0.62	900	150	-	-	>100	-	0	TO-5, response down to 200 nm
UV-215BGH/340	2.5	5.1	0.62	900	150	-	-	>100	-	0	Increased performance at 340 nm
UV-215BQH	5.5	23.4	0.62	900	700	-	-	>50	-	0	TO-5, response down to 200 nm
UV-245BGH	5	18.5	0.62	900	630	-	-	>75	-	0	TO-5, response down to 250 nm
UV-245BQH	5	18.5	0.62	900	630	-	-	>75	-	0	TO-5, response down to 200 nm

Figure 1

Pigtailed TO-18 Package*



*Note: Package dimensions for indication only. Exact package dimensions can be found on products datasheets.

PIN Photodiodes

YAG and Quadrant Detectors

YAG-optimized and Quadrant Detectors

Applications

- Semi-Active Laser Seeker
- Missile Guidance Systems
- Laser Spot Tracking
- Laser Warning Receivers
- Instrumentation

Features and Benefits

- Quadrants defined with no dead zone
- Planar diffused
- Large area
- Wide dynamic range
- >50% DC quantum efficiency at 1064 nm
- 40% typical responsivity at room temperature, can reach 60% with internal heating element
- Wide spectral range
- >90% DC quantum efficiency at 900 nm
- Peak responsivity: 0.7 A/W at 1000 nm

Product Description

Excelitas Technologies' YAG series of Silicon PIN single-element and quadrant detectors are high-performance N-type or P-type Si PIN photodiodes in hermetically sealed TO packages. These photodiodes perform well over the 400 nm to 1100 nm wavelength range, with enhanced IR responsivity, making them ideal for 1064 nm detection applications.

Designed with a guard ring to collect current generated outside of the active area, they are the detectors of choice when the entire chip is illuminated by reducing unwanted carriers responsible for noise.

Precise beam positioning can be achieved by using our quadrant detectors. They are designed with 4 pie-shaped quadrant sections created via the doping process, thus reducing the dead space between each quadrant to almost zero. Each quadrant is then connected to an isolated lead.

The YAG series offers an exceptional 0.4 A/W at 1064 nm by using a thick silicon material. While the C30665GH-4 can offer similar performance at 1064 nm and extend detection towards 1550 nm for detection of eye-safe laser range finders and designators.

The YAG series can include a resistive heater and temperature sensor within the hermetic enclosure to help further increase the responsivity at the YAG wavelength or with additional anti-reflection coating (ARC) further increasing the transmission through the front window. These options can be ordered with the –H (heater) , -AR (coating) or –ARH (both features) suffix.

Recognizing that different applications have different performance requirements, Excelitas offers a wide range of customization of these photodiodes to meet your unique design challenges. Various active area, custom device testing/qualification and packaging options (hermetic metal can, high shock resistance packaging, ceramic carrier, custom pin-out configuration, heater-options, etc.) are among many of the application specific solutions available.

Product Table

Quadrant Detectors

Unit	Description	Active Diameter mm	Active Area mm^2	Capacitance per quadrant pF	Rise/Fall Time ns	Dark Current per quadrant nA	Breakdown Voltage min V	Responsivity 900 nm A/W	Responsivity 1064 nm A/W	Noise Current per quadrant pA/ √Hz	Package
C30845EH	900 nm Quadrant PIN	8	50	8	6	70 nA	100	0.6	0.17	0.26	TO-8
YAG-444-4AH*	1064 nm Quadrant PIN	11.5	100	9	12	30	200	0.6	0.5	0.2	Custom
YAG-444N-4AH*	1064 nm Quadrant PIN	11.5	100	9	12	30	200	0.6	0.5	0.1	Custom
YAG-555-4AH*	1064 nm Quadrant PIN	14.1	156	12	12	50	200	0.6	0.5	0.2	Custom
YAG-555N-4AH*	1064 nm Quadrant PIN	14.1	156	12	12	50	200	0.6	0.5	0.1	Custom
C30665GH-4	1550 nm Quadrant PIN	3	7	100 pF @ 2V 40 pF @ 25V	14	2	50	0.8 @ 1064 nm	1.05 @ 1550 nm	0.08	Custom TO-5

* The YAG series of quadrant PIN photodiodes are available with built-in heater package, upon request.

Product Table

Single Element Detectors

Unit	Active Diameter mm	Active Area mm²	Responsivity Peak A/W	Peak Wavelength nm	Capacitance pF	Rise/Fall Time ns	Dark Current nA	Shunt Resistance MΩ	Breakdown Voltage V	Operating Voltage V	Package
YAG-100AH	2.5	5.1	0.7	1000	2.5	5	<20	-	>200	180	TO-5
YAG-200H	5	20	0.7	1000	6	5	<100	-	>200	180	TO-8
YAG-444AH	11.3	100	0.7	1000	35	5	<200	-	>200	180	Custom

NOTE: The YAG series of single-element PIN photodiodes are also available with a built-in heater or optional anti-reflection coating, upon request.

Figure 1

YAG-100AH TO-5 Package*

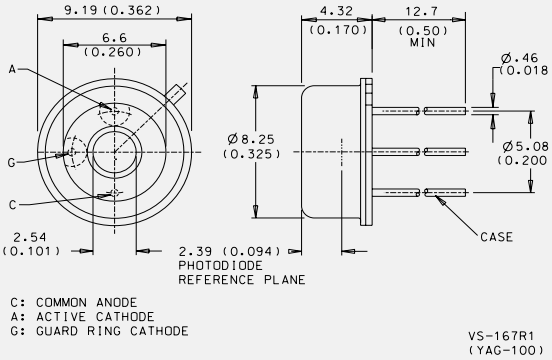


Figure 2

YAG-200H TO-8 Package*

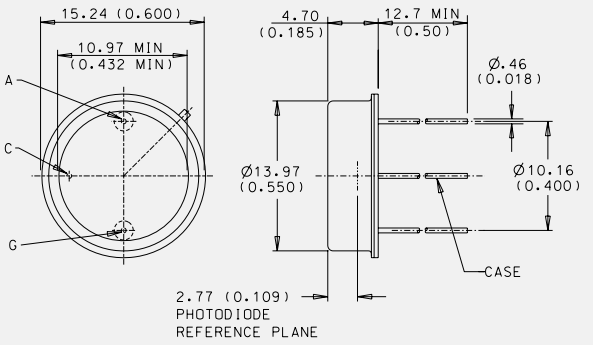


Figure 3

YAG-444AH Custom 1-inch Package*

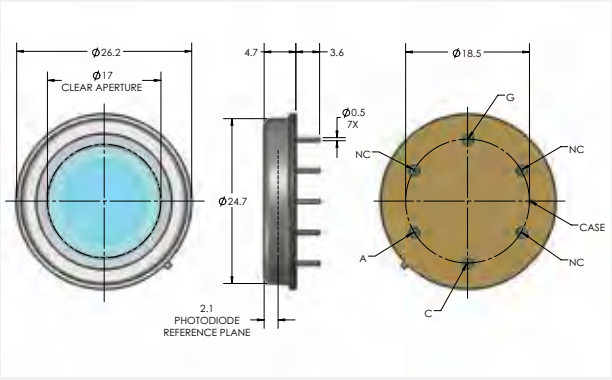
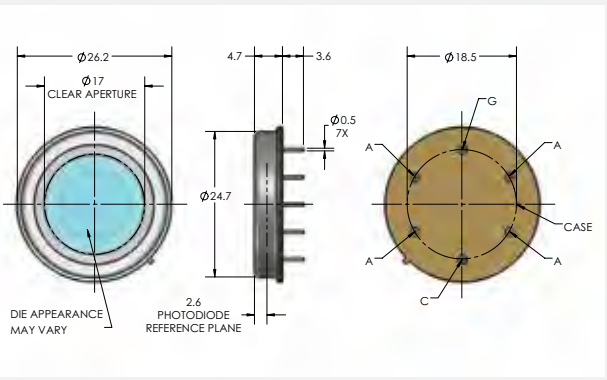


Figure 4

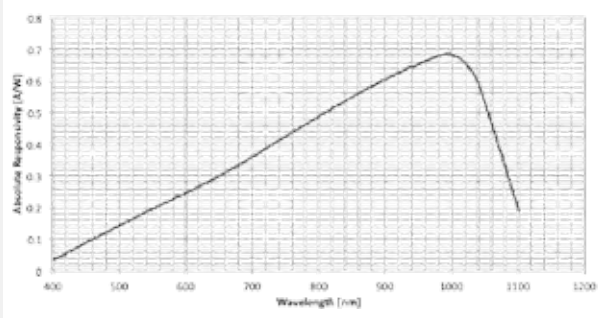
YAG-444-4AH Custom 1-inch Package*



*Note: Package dimensions for indication only. Exact package dimensions can be found on products datasheets.

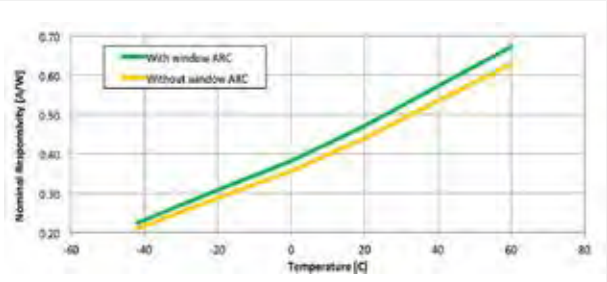
Graph 1

YAG Room-temperature Spectral Responsivity

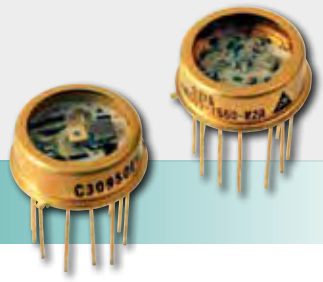


Graph 2

YAG Responsivity as a function of temperature



PIN and APD Hybrid Receivers



Si PIN and APD Modules – InGaAs APD Modules

Applications

- Laser Range Finder
- Target Designator
- Optronics Pod
- LIDAR & LADAR
- Target Recognition
- Obstacle Avoidance Scanner

Features and Benefits

- Ultra low noise
- High speed
- High transimpedance gain
- Customization available upon request

Product Description

These hybrid receivers comprise of a photodetector (PIN or APD) and a transimpedance amplifier in the same hermetically-sealed package. Having both amplifier and photodetector in the same package avoids noise pickup from the surrounding environment and reduces parasitic capacitances from interconnect allowing lower noise operation.

The C30659 series includes an APD connected to a low noise transimpedance amplifier. 4 models are offered with a Silicon APD and 2 models offered with an InGaAs APD. Standard band-width of 50 MHz and 200 MHz can accommodate a wide range of applications. The C30659 models are offered with the APD mounted on a thermo-electric cooler (the LLAM series) to help improve noise or to keep the APD at constant temperature regardless of the ambient temperature.

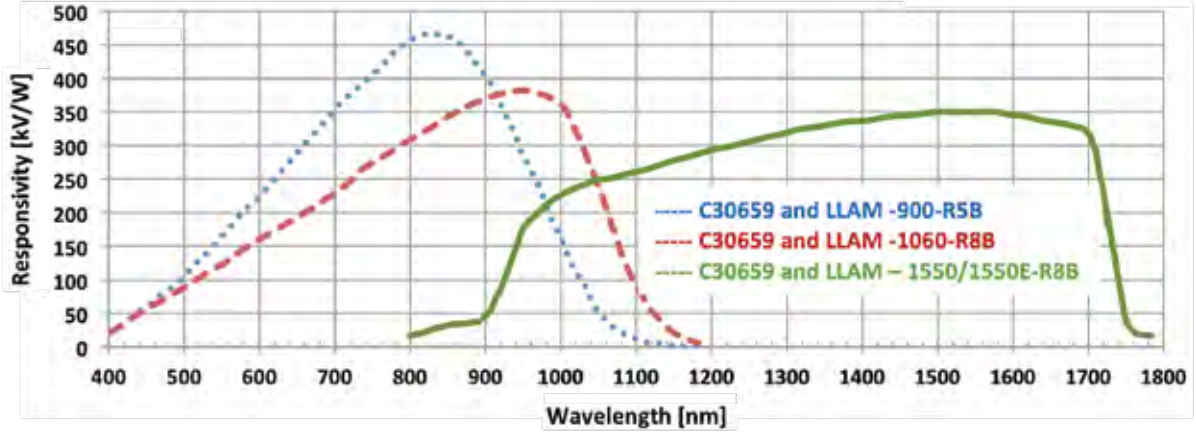
The C30659 can be customized to meet application specific requirements by using one of the Excelitas rear entry APDs, by choosing a custom bandwidth or by qualifying it to your environmental conditions. Pigtailed versions are also available.

Both the C30659 and LLAM series have options for enhanced higher damage thresholds, thus providing greater resilience when exposed to high optical power densities. The C30950EH offers a low cost alternative to the C30659. The amplifier is designed to neutralize the input capacitance of a unity voltage gain amplifier. The C30919E uses the same architecture of the C30950EH with the addition of a high voltage temperature compensation circuit which maintain module responsivity constant over a wide temperature range.

The HUV modules are offered with a PIN detector for low frequency high gain application, covering a broad spectrum range from the UV to the near IR. All optical receiver products can be qualified to meet the most demanding environmental specification as described in MIL-PRF-38534. Space qualified options are also available.

Figure 1

APD Receiver Responsivity vs. Wavelength



Product Table

Si PIN and APD Modules – InGaAs APD Modules

Unit	Detector	Active Diameter mm	Bandwidth MHz	Responsivity, 900 nm kV/W	Responsivity, 1060 nm kV/W	Responsivity, 1550 nm kV/W	NEP fW/√Hz	Output Voltage Swing, 50 Ohm V	Package
C30659-900-R5BH	C30902	0.5	200	400		-	40	0.9	TO-8
C30659-900-R8AH	C30817	0.8	50	3000		-	12	0.9	TO-8
C30659-1060-R8BH	C30954	0.8	200	370	200	-	100	0.9	TO-8
C30659-1060-3AH	C30956	3	50	450	280	-	90	0.9	TO-8
C30659-1550-R08BH	C30645	0.08	200	-	-	90	220	0.9	TO-8
C30659-1550E-R08BH*	C30645	0.08	200	-	-	90	220	0.9	TO-8
C30659-1550-R2AH	C30662	0.2	50	-	-	340	130	0.9	TO-8
C30659-1550E-R2AH	C30662	0.2	50	-	-	340	130	0.9	TO-8
C30919E	C30817	0.8	40	1000	250	-	20	0.7	TO, 1 in
C30950EH	C30817	0.8	50	560	140	-	27	0.7	TO-8
LLAM-1550-R08BH	C30645	0.08	200	-	-	90	220	0.9	TO-8 FLANGE
LLAM-1550E-R08BH	C30645	0.08	200	-	-	90	220	0.9	TO-8 FLANGE
LLAM-1550-R2AH	C30662	0.2	50	-	-	340	130	0.9	TO-8 FLANGE
LLAM-1550E-R2AH	C30662	0.2	50	-	-	340	130	0.9	TO-8 FLANGE
LLAM-1060-R8BH	C30954	0.8	200	370	200	-	55	0.9	TO-8 FLANGE
LLAM-1060-R8BH-FC	C30954	0.8	200	370	200	-	55	0.9	TO-8 FLANGE+FC
LLAM-1060E-R8BH*	C30954	0.8	200	370	200	-	55	0.9	TO-8 FLANGE
HUV-1100BGH	UV-100	2.5	0.001	130 MV/W	-	-	30	5 min	CUSTOM
HUV-2000BH	UV-215	5.4	0.001	130 MV/W	-	-	70	6 min	CUSTOM
HeliX-902-200	C30902	0.5	200	650	-	-	50	1	CUSTOM
HeliX-954-200	C30954	0.8	200	360	-	-	110	1	CUSTOM

* "E" versions of the receivers are with enhanced damage threshold over exposure protection feature.

Figure 1

TO-8 Package for C30659 Devices*

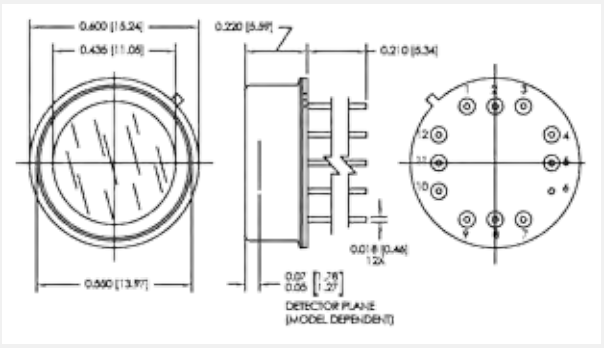


Figure 2

TO Flange Package for LLAM Devices*

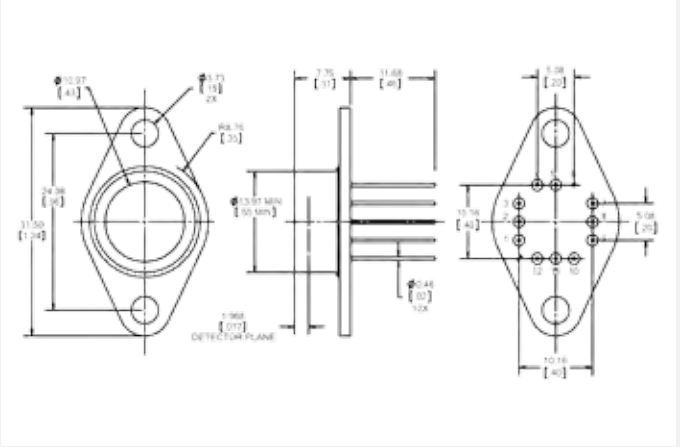
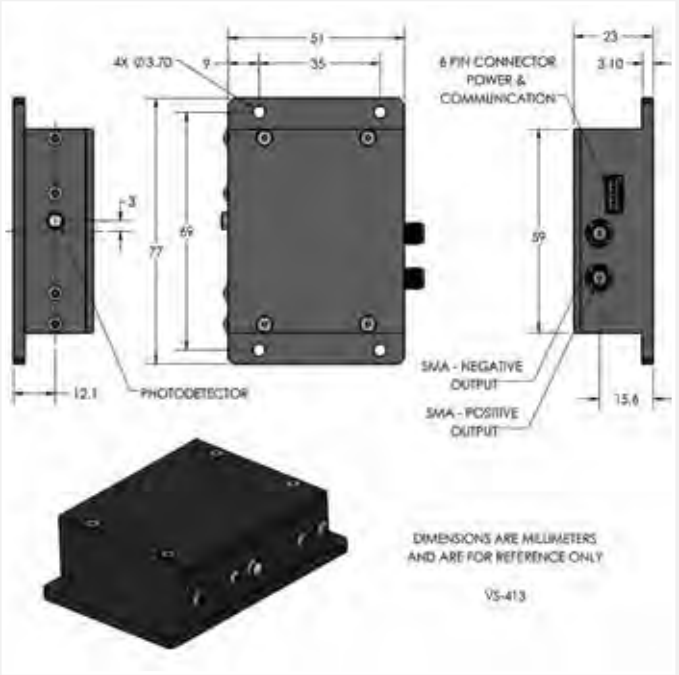


Figure 3

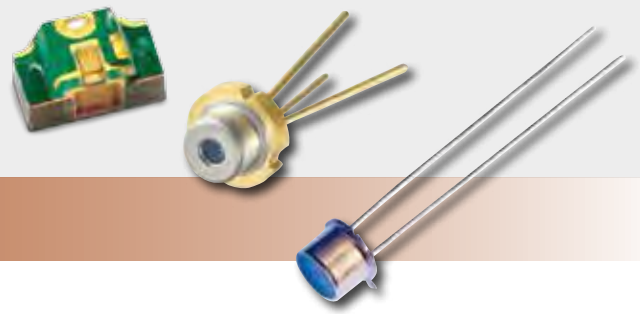
HeliX APD Module



*Note: Package dimensions for indication only. Exact package dimensions can be found on products datasheets.

High Power Laser Diode

For Ranging



Pulsed Laser Diodes – 905, 1064 and 1550 nm

Applications

- Laser Range Finder
- Proximity Fuze
- Height of Burst
- Beam Rider Transmitter
- LIDAR & LADAR
- Training & Simulation

Features and Benefits

- Multi-cavity lasers concentrate emitting source size
- Quantum well structure
- High peak pulsed power into aperture
- Excellent power stability with temperature
- Customization available upon request
- Overdriving of lasers is possible, please contact us for more information

Product Description

Pulsed semiconductor lasers in the near IR are commonly used for long-distance time-of-flight or phase-shift range-finder or LIDAR systems. Excelitas offers a broad range of ideally-suited pulsed 905 nm laser designs including multi-cavity monolithic structures with up to 4 active areas per chip resulting in up to 100 W of peak optical output power. Physical stacking of laser chips is also possible, resulting in up to 300 W of peak optical output power.

Chip-on-board assemblies are available for hybrid integration. A selection of 6 metal, hermetically-sealed package types are available for harsh environment applications. A molded epoxy resin TO-18 type package and a surface-mount overmoulded chip-on-ceramic package are available for high-volume applications.

Critical parameters are pulse-width and rise/fall times. The pulse width may be reduced allowing for increased current drive and resulting in higher peak optical power. Quantum-well laser design offers rise and fall times of <1ns but the drive circuit lay-out and package inductance play the greater role in determining rise/fall times, and should be designed accordingly. Excelitas offers a variety of package types with different inductance values to assist to this end.

Our core competencies include: MOVPE wafer growth; wafer processing of the grown GaAs wafers; assembly using either epoxy or solder die attach; epoxy encapsulation of lasers mounted on lead frame; hermetically-sealed product qualification to MIL-STD and custom requirements.

Excelitas also offers 1064 nm and 1550 nm (PVG series) pulsed laser diodes, please contact us for more information.

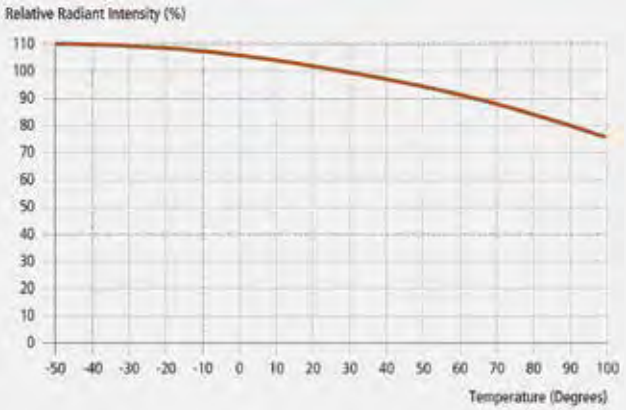
Product Table

PGA Pulsed Laser Family Selection Table, Typ. Wavelength 905 nm, 5 mm Spectral Width

Device (X = pkg) (H = RoHS Compliance)	Description		Emitting Area		Typical Peak Power at 10A, 100 ns	Typical Peak Power at 30A, 100 ns	Beam Spread Parallel to Junction (FWHM)	Beam Spread Perpendicular to Junction (FWHM)	Typical Temperature Coefficient	Preferred Packages		
	# of Chips	Total # of Emitting Stripes	Width µm	Height µm	75 µm (3 mils) Stripe Width	225 µm (9 mils) Stripe Width	Θ_{II}	$\Theta^{\perp}$	nm / °C	"S" Metal Can TO-18	"LU" High Volume Metal TO-56	"D" Epoxy Encapsulated SMT
PGAx1S03H	1	1	75	1	8 W		10	25	0.25	✓		✓
PGAx1S09H	1	1	225	1		25 W	10	25	0.25	✓		✓
DPGAx1S03H	1	2	75	5	16 W		10	25	0.25	✓	✓	✓
DPGAx1S09H	1	2	225	5		50 W	10	25	0.25	✓		✓
TPGAx1S03H	1	3	75	10	23 W		10	25	0.25	✓	✓	✓
TPGAx1S09H	1	3	225	10		75 W	10	25	0.25	✓	✓	✓
QPGAx1S03H	1	4	75	15	30 W		10	25	0.25	✓	✓	✓
QPGAx1S09H	1	4	225	15		90 W	10	25	0.25	✓		✓
TPGAx2S03H	2	6	75	175	45 W		10	25	0.25	✓		
TPGAx2S09H	2	6	225	175		150 W	10	25	0.25	✓		
QPGAx2S03H	2	8	75	225	58 W		10	25	0.25	✓		
QPGAx2S09H	2	8	225	225		175 W	10	25	0.25	✓		
QPGAx3S03H	3	12	75	450	85 W		10	25	0.25	✓		
QPGAx3S09H	3	12	225	450		255 W	10	25	0.25	✓		

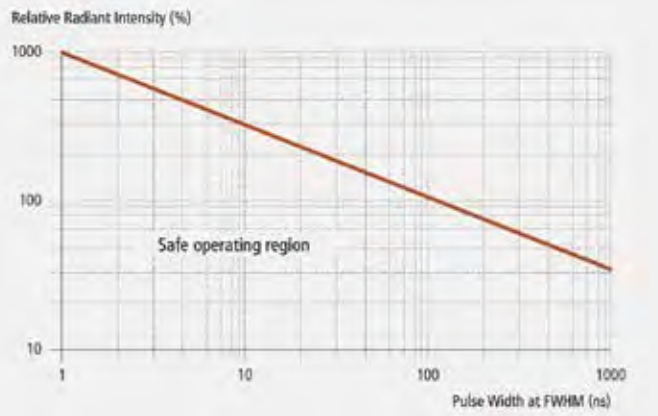
Graph 1

Peak Radiant Intensity vs. Temperature



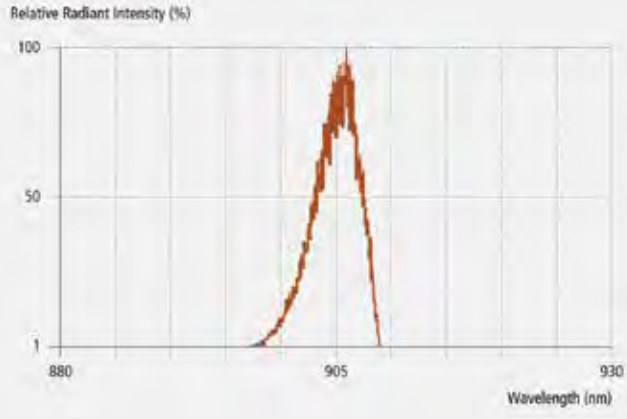
Graph 4

Radiant Intensity vs. Pulse Width for Safe Operation



Graph 3

Spectral Plot Distribution



Graph 6

Center Wavelength vs. Temperature

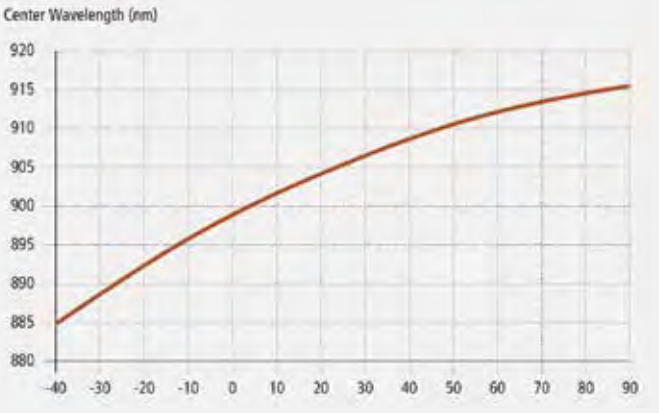
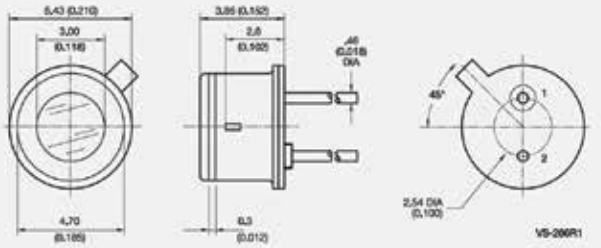


Figure 1

Package S Drawing*

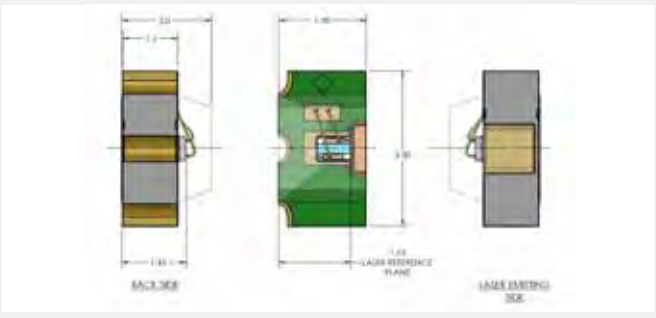


Package S (TO-18)

Pin out
1. LD Anode (+),
2. LD Cathode (-) Case,
Inductance 5.2 nH

Figure 2

Package D Drawing*



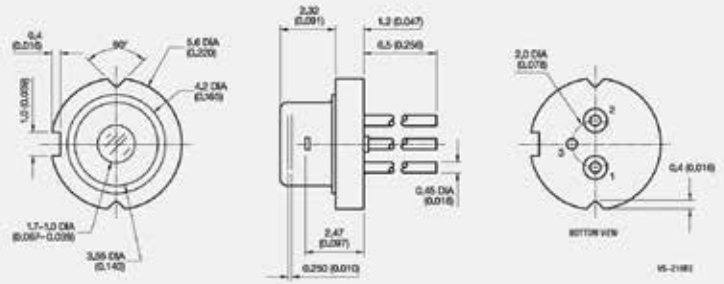
Package D (Surface Mount)

Inductance 1.6 nH

*Note: Package dimensions for indication only. Exact package dimensions can be found on products datasheets.

Figure 2

Package U Drawing*

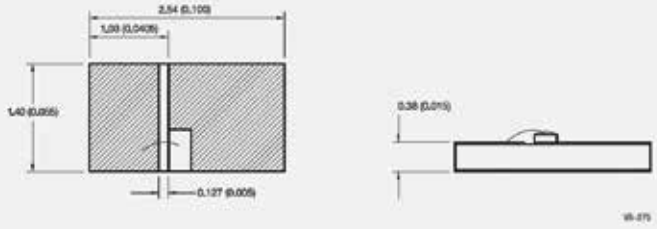


Package U (5 mm CD)

Pin out
1. LD Anode (+),
2. NC,
3. LD Cathode (-) Case,
Inductance 5.0 nH

Figure 3

Package Y Drawing • Laser Chip on Board

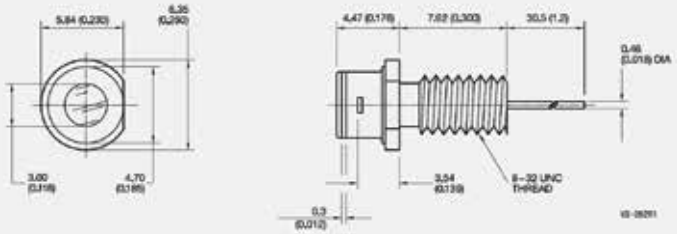


Package Y (Chip on Carrier)

Pin out
1. LD Cathode (-)
chip bottom,
2. LD Anode (+)
chip top,
Inductance 1.6 nH

Figure 4

Package C Drawing*

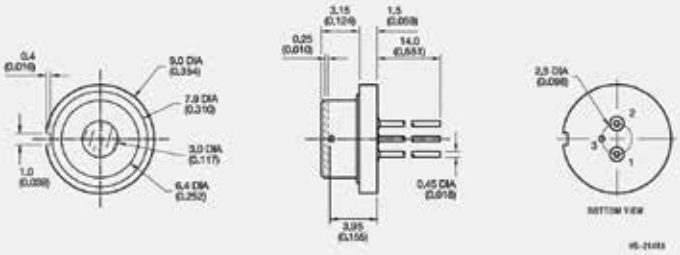


Package C (8–32 Coax)

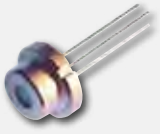
Pin out
1. LD Anode (+),
2. LD Cathode (-) Case,
Inductance 12 nH

Figure 5

Package R Drawing*



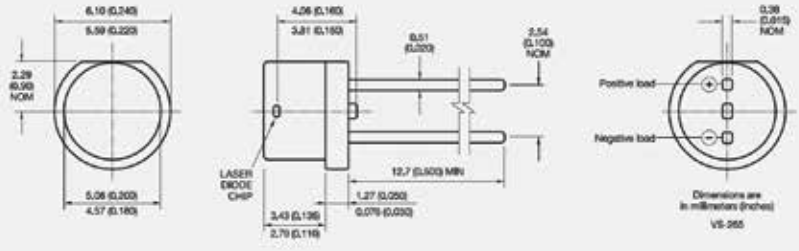
Package R (9 mm CD)



Pin out
1. LD Anode (+),
2. NC,
3. LD Cathode (-) Case,
Inductance 6.8 nH

Figure 6

Package W Drawing • Plastic Package (1S Devices Only)*



Package W (TO-18 Plastic)

Pin out
1. (Pkg Flat)
LD Anode (+),
2. LD Cathode (-),
Inductance 5.0 nH

*Note: Package dimensions for indication only. Exact package dimensions can be found on products datasheets.

Detectors for Laser Warning Systems

EXACTD-362 – Detector for Laser Warning Systems

Applications

- Laser Warning Receiver Systems
- Position Determining Systems
- Direction Aids

Features and Benefits

- Spectral sensitivity range of 500 – 1650 nm
- ±0.8° AoA accuracy - in either azimuth or elevation
- FOV is ±45° for both azimuth and elevation angles.
- Low- and High-sensitivity channels for wide dynamic range

Product Description

Excelitas' EXACTD-362 detector is designed for use in Laser Warning Receiver Systems to detect and provide precise angle-of-arrival (AoA) information of incident light emitted by laser range finders, laser target designators, and active laser Electro-Optic (E.O.) systems.

The module makes use of 9-element Si and InGaAs detector arrays assembled in a sandwich configuration, in conjunction with light guides and a 6-bit digital Gray code mask which, through shadowing of the individual channels, encode the incident laser beam AoA into a digital pattern. Figure 1 illustrates the Principle of Operation with only four channels (bits) without any reference channels. Figure 2 shows the overall spectral responsivity of the sandwiched Silicon and InGaAs detector elements, resulting in a combined spectral sensitivity range of 500 - 1650 nm. While Figure 3 shows the mechanical characteristics of the compact module.

Each module features two isolated arrays providing individual High- and Low- sensitivity channels. The first array exhibits high quantum efficiency over the full wavelength range, while the signal in the second array is attenuated by about 15 dB, further extending the dynamic range for detection of high power laser pulses. The module's field-of-view (FoV) is ±45° for both azimuth (horizontal plane) and elevation (vertical plane) angles. Its 6-bit Gray code design allows encoding of incident AoA with an angular resolution of ±0.8°, in either azimuth or elevation, depending on the module's orientation. Three reference channels, illuminated for all incident angles, are provided in each array for baseline signal level determination.

Figure 1 - Principle of Operation

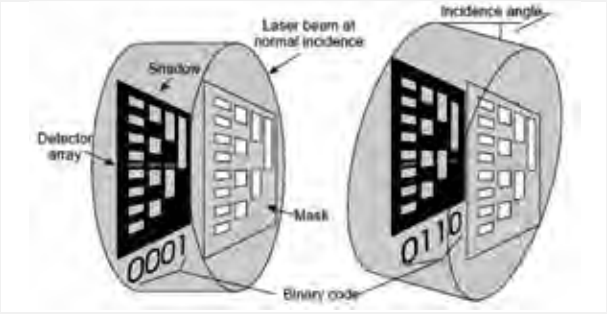


Figure 2 - Typical Responsivity

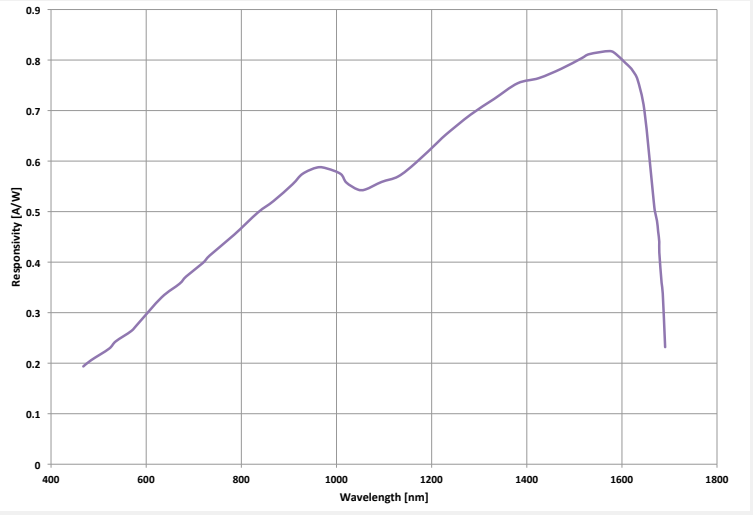
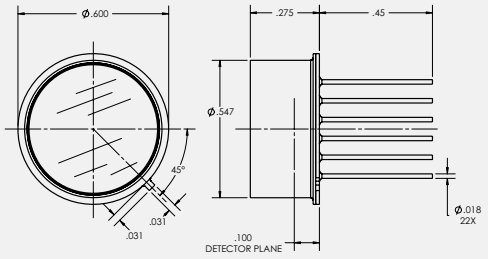


Figure 3 - Mechanical Characteristics*



*Note: Package dimensions for indication only. Exact package dimensions can be found on product datasheets.

EXCELITAS TECHNOLOGIES®

Excelitas Technologies – Defense and Aerospace Solutions

Solutions for Your Projects

- Power Supplies
- Energetics Modules
- Electronic Safe, Arm and Fire (ESAF) Modules
- Missile Domes
- Spark Gaps
- Sensors/Optics Components
- Rubidium Atomic Frequency Standard (RAFS)

Please Reach Out to Us

Learn more about our other offerings which can enable you to deliver high-quality mission-critical subsystems.

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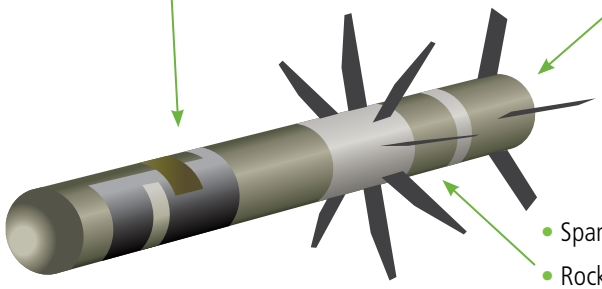
- Safe LEEFI Detonator: the Blue Chip®
- Shock Hardened LEEFI Detonator for Tandem Charge

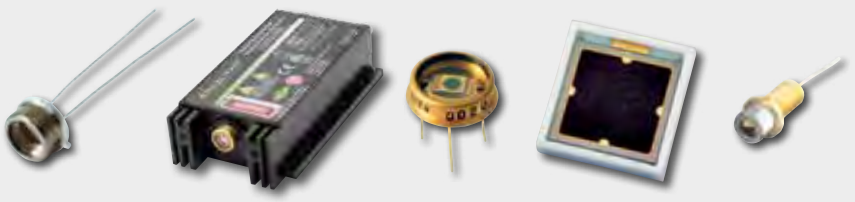
- Dome
- Quadrant Photodiode and Lense for Semi-Active Laser Terminal Guidance
- Optics for Seeker Head
- Camera Modules
- Laser Diodes, Photodiodes and Lenses for Proximity Sensor



Photodiodes, Lenses and Filters for Beam Rider Guidance

- Spark Gaps
- Rocket Motor Initiator / Ignition Safety Device
- AC/DC and DC/DC Converters
- Firing Diode

EXCELITAS TECHNOLOGIES®



Excelitas Technologies – Photon Detection Solutions

Markets & Applications

Life Sciences & Analytical

- Luminescence and fluorescence for analytical and clinical diagnostics
- Photon counting
- Particle sizing
- PET, CT, MRI scanning

Safety & Security

- X-ray scanning of luggage, cargo & food
- LIDAR for autonomous vehicles and drones
- Smoke and particle detection
- Safety curtains

High Volume Electronics

- Laser range finding, industrial and consumer
- Vital signs monitoring for wearables
- Gesture recognition
- Light detection and measurement

Engage, Enable, Excel.

Everything we do revolves around this important principle. We work from Engineer to Engineer to understand your needs and tailor our solutions to exceed these needs and enable you to excel in what you do best.

Excelitas offers a complete suite of solutions for your detection needs, from individual components to plug and play modules. Our products range from high volume C30737 series of avalanche photodiodes (APDs) for range finding, to our high performance C30902 series of reach through APDs, to our outstanding single photon counting module , to pulsed laser diodes, and everything in between.

With more than 50 years of market leading performance in silicon and InGaAs detection capabilities, Excelitas offers proven expertise in customizing to specific needs and help bring your next generation platforms to market. Whether you are working in the UV, visible or near IR, or even looking to detect X-ray or Gamma rays, we have the knowledge and solutions that will help get you to market faster.

Excelitas offers one- stop shopping capabilities for both detectors and emitters for those looking to develop range finding or LIDAR- based systems, which helps to simplify the supply chain and provide economies of scale. We are fully vertically integrated giving us maximum flexibility in product design at competitive pricing. Contact us to find out more on how we can help you succeed.

Notes

About Excelitas Technologies

Excelitas Technologies Corp. is a global technology leader focused on delivering innovative, high-performance, market-driven photonic solutions to meet the lighting, detection and other technology needs of global customers. From biomedical technology to research laboratory, safety and security, consumer, semiconductor, industrial, energy and environment, as well as defense and aerospace applications, Excelitas Technologies is committed to enabling our customers' success in their end-markets. Excelitas Technologies has approximately 5,500 employees in North America, Europe and Asia, serving customers across the world.

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