

Photonics Devices



Photonics Devices

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Type of Response	Characteristics	Window Mat'l	Applications
Normal	Biased, fast response time, low capacitance	Borosilicate	High light levels, pulse detectors, AC light measurement
UV/Blue Enhanced	Unbiased, high shunt resistance, low noise, long term stability	Quartz	Low light levels, wide spectral bandwidth response
Low Noise	Unbiased, low dark current, high shunt resistance	Borosilicate	Low light levels, long integration times
High Speed	Biased, low capacitance, >10MHz response	Borosilicate	Medium light levels, high pulse response detection



Note: All data table values are typical (unless noted) and for a temperature of 23°C.

Biased: Normal Response ($V_{BIAS} = -10V$)

*Square Sensor Size **Rectangular Sensor Size

Active Area (mm ²)	R (A/W) @970nm	NEP (W/Hz ^{1/2}) @-10V, 970nm	D (cmHz ^{1/2} /W) @-10V, 970nm	Capacitance (pF)		I _d (nA) @-10V	BDV Max. (V)	T _R (nsec) -10V/50Ω, 632nm	Operating Temp (°C)	Mount	Stock No.
				0V	-10V						
0.2	0.65	2.8 x 10 ⁻¹⁵	1.6 x 10 ¹³	4	1	0.01	30	6	-40 to 100	TO-18	UNI57506
0.81	0.65	6.2 x 10 ⁻¹⁵	1.45 x 10 ¹³	8	2	0.05	30	8	-40 to 100	TO-18	UNI57507
3.2**	0.65	1.1 x 10 ⁻¹⁴	1.63 x 10 ¹³	45	12	0.15	30	10	-40 to 100	TO-18	UNI53372
5.1	0.65	1.4 x 10 ⁻¹⁴	1.61 x 10 ¹³	85	15	0.25	30	12	-40 to 100	TO-5	UNI53371
16.4	0.65	1.9 x 10 ⁻¹⁴	2.13 x 10 ¹³	330	60	0.5	30	17	-40 to 100	TO-8	UNI54034
44.0*	0.65	2.8 x 10 ⁻¹⁴	2.37 x 10 ¹³	700	130	1	30	24	-40 to 100	TO-8	UNI54035
100	0.65	3.9 x 10 ⁻¹⁴	2.56 x 10 ¹³	1500	300	2	30	43	-10 to 60	BNC	UNI53373
613	0.65	1.1 x 10 ⁻¹³	2.25 x 10 ¹³	9500	1800	15	30	250	-10 to 60	See web	UNI53374

Biased: High Speed Response ($V_{BIAS} = -50V$)

Active Area (mm ²)	R (A/W) @900nm	NEP (W/Hz ^{1/2}) @-50V, 950nm	D (cmHz ^{1/2} /W) @-50V, 950nm	Capacitance (pF)		I _d (nA) @50V	BDV (V) @10μA	T _R (nsec) 60V/50Ω, 670nm	Operating Temp (°C)	Mount	Stock No.
				0V	50V						
1	0.45	2.3 x 10 ⁻¹⁴	4.35 x 10	10	2	0.5	50	2	-25 to 85	TO-8	UNI62270

Unbiased: Blue Enhanced Response ($V_{BIAS} = 0V$)

Active Area (mm ²)	R (A/W) @410nm	NEP (W/Hz ^{1/2}) @0V, 410nm	D (cmHz ^{1/2} /W) @0V, 410nm	Capacitance (pF)		I _{scf} Max. (mA)	R _{sh} Min. (MΩ)	T _R (μsec) 0V/50Ω	Operating Temp (°C)	Mount	Stock No.
				0V	50V						
0.81	0.2	2.0 x 10 ⁻¹⁴	4.5 x 10 ¹²	60		0.5	600	0.02	-10 to 60	TO-18	UNI57508
5.1	0.2	5.2 x 10 ⁻¹⁴	4.34 x 10 ¹²	45		2	150	0.2	-10 to 60	TO-5	UNI53378
100	0.2	2.0 x 10 ⁻¹³	5.0 x 10 ¹²	8800		10	10	2	-10 to 60	BNC	UNI53379

Unbiased: Low Noise Response ($V_{BIAS} = -5V$)

**Square Sensor Size

Active Area (mm ²)	R (A/W) @900nm	NEP (W/Hz ^{1/2}) @-5V, 950nm	D (cmHz ^{1/2} /W) @-5V, 950nm	Capacitance (pF)		I _{scf} (mA)	R _{sh} Min. (MΩ)	T _R (nsec) 5V/50Ω, 670nm	Operating Temp (°C)	Mount	Stock No.
				0V	50V						
5.1	0.62	1.8 x 10 ⁻¹⁴	1.25 x 10 ¹³	87	26	0.51	600	15	-40 to 110	TO-5	UNI54522
100.0*	0.62	8.6 x 10 ⁻¹⁴	1.2 x 10 ¹³	1700	500	10	30	200	-20 to 75	see web	UNI57513

Unbiased: UV Enhanced Response ($V_{BIAS} = 0V$)

Active Area (mm ²)	R (A/W) @254nm	NEP (W/Hz ^{1/2}) @0V, 254nm	D (cmHz ^{1/2} /W) @0V, 254nm	Capacitance (pF) 0V	I _{scf} Max. (mA)	R _{sh} Min. (MΩ) @-10mV	T _R (μsec) 0V/50Ω, 254nm	Operating Temp (°C)	Mount	Stock No.
0.8	0.14	6.4 x 10 ⁻¹⁴	1.4 x 10 ¹²	60	0.1	500	0.2	-20° to 60°	TO-5	UNI57509
5.1	0.14	1.0 x 10 ⁻¹³	2.26 x 10 ¹²	300	0.1	200	0.9	-20° to 60°	TO-5	UNI53375
15**	0.14	1.4 x 10 ⁻¹³	2.8 x 10 ¹²	800	0.1	100	2	-20° to 60°	TO-5	UNI57510
20	0.14	2.0 x 10 ⁻¹³	2.24 x 10 ¹²	1000	0.1	50	2	-20° to 60°	TO-8	UNI54036
35.0**	0.14	1.7 x 10 ⁻¹³	3.48 x 10 ¹²	1600	0.1	30	3	-20° to 60°	TO-8	UNI54037
50	0.14	2.6 x 10 ⁻¹³	2.72 x 10 ¹²	2500	0.1	20	3.5	-10° to 60°	BNC	UNI53376
100	0.14	4.5 x 10 ⁻¹³	2.22 x 10 ¹²	4500	0.1	10	5.9	-10° to 60°	BNC	UNI53377

InGaAs Photodiodes

- * Response Range from 900nm to 1700nm
- * High Responsivity
- * Package Supports Single and Multi-Mode Fiber Coupling
- * 1.3µm and 1.5µm Sensitivity
- * Both Small Area (High Speed) and Large Area



InGaAs photodiodes offer superb response from 900nm to 1700nm, perfect for telecom and near-IR detection. The 70 and 120 micron photodiodes are offered in isolated TO-46 packages with a lensed cap for single mode and multimode fiber coupling. These two sizes are also available with actively aligned FC receptacles. The 70 micron photodiode is perfect for high bandwidth applications while the 120 micron photodiode is perfect for active alignment applications. The 3mm photodiode is isolated in a TO-5 package with a broadband double sided AR-coated window. With the high shunt resistance, the 3mm photodiode is suitable for high sensitivity to weak signal applications.

InGaAs Photodiodes

*Specified @V=0.5V

Sensor Dia.(µm)	R (A/W) @1310nm/1550nm	Capacitance (pF) (@ V=-5V)	Dark Current (nA) (@ V=-5V)	Rise/Fall Time (nsec) (@ V=-5V)	Max. Reverse Volt. (V)	Max. Reverse Current (mA)	Max. Forward Current (mA)	Shunt Resistance(MΩ) (V=-10mV)	NEP (W/Hz ^{1/2})	Package Style	Stock No.
70	0.9/0.95	0.65	0.03	0.2	20	1	5	-	3.44 x 10 ⁻¹⁵	TO-46	UNI55753
										FC Receptacle	UNI55756
120	0.9/0.95	1	0.05	0.3	20	2	5	-	4.5 x 10 ⁻¹⁵	TO-46	UNI55754
										FC Receptacle	UNI55757
500	0.9/0.95	18.5	0.2	10	15	5	45	-	8.42 x 10 ⁻¹⁵	TO-46	UNI62271
3000	0.9/0.95	750	0.5	85*	2	20	100	20M	4.5 x 10 ⁻¹⁴	TO-5	UNI59140

Solderable Photodiodes

- * Feature Two 3" Long Leads Soldered to the Anode and Cathode
- * Spectral Response of 360 – 1100nm with Peak at 970nm
- * Photoconductive and Photovoltaic Types Available.

Solderable Photodiodes are designed for applications with low noise. For large signal outputs, these photodiodes can be connected directly to a current meter, or across a resistor for voltage measurements. Additionally, output can be measured directly with an oscilloscope or an amplifier.



Solderable Photodiodes

Active Area (mm ²)	Active Area Size (mm)	Chip Size (mm)	Responsivity (A/W) @ 970nm		Photoconductive			Photovoltaic		
			min.	typ.	Max. Dark Current (nA) @ -5V	Capacitance (pF) @ -5V	Stock No.	Min. Shut Resistance (MΩ) @ -10mV	Capacitance (pF) @ 0V	Stock No.
4.7	1.7x2.8	1.9 x 4.1	0.6	0.65	20	15	UNI84996	10	370	UNI84987
9.6	2.3x4.2	2.5 x 5.1	0.6	0.65	40	30	UNI84997	8	750	UNI84992
25.8	5.1x5.1	5.5 x 6.0	0.6	0.65	100	95	UNI84998	5	2100	UNI84998
25.4	2.5x10.1	3.4 x 10.5	0.6	0.65	100	95	UNI84999	5	2100	UNI84995
51	2.5x20.3	3.4 x 20.6	0.6	0.65	300	200	UNI85000	3	4000	UNI84993
82.6	4.1x20.1	5.2 x 20.4	0.6	0.65	500	300	UNI85001	2	6000	UNI84994
93.4	9.7x9.7	10.5 x 11.0	0.6	0.65	600	375	UNI85003	1	8500	UNI84989
105.7	4.5x23.5	5.5 x 23.9	0.6	0.65	800	450	UNI85004	0.5	10000	UNI84990
189	9.2x20.7	10.2 x 21.0	0.6	0.65	1200	750	UNI85005	0.2	17000	UNI84991



- * Consists of Detector and Pre-Amplifier Electronics
- * Voltage Output Directly Proportional to Input Current
- * Si, InGaAs, PbS and PbSe Detectors Available
- * Standard and TE Cooled Options



Our photodiode receiver modules simplify electro-optical system integration by combining a detector with dual-gain preamplifier circuitry in a compact package. By optimizing both in a single unit, electromagnetic interference is minimized without sacrificing package size or convenience. The built-in pre-amplifier electronics allow direct voltage readout of any UV, visible, or NIR source with an oscilloscope or data acquisition (DAQ) system. Applications include spectroscopy, camera triggering, laboratory experimentation, and industrial OEM integration. UV and VIS detectors are silicon; NIR detectors are InGaAs, PbS or PbSe. PbS and PbSe detectors require a modulated infrared signal for operation. Thermo Electrically Cooled options have improved temperature stability as well as higher signal to noise ratio. Signal is output via BNC connector and operating temperature is 22°C for standard options and -30°C for TE Cooled. DB-9 power supply cable is included. Responsivity, noise, and bandwidth specifications are given for low / high settings.

Power Supplies

Receiver Module Power Supplies

- * Low Noise, ±15V DC Output
- * Universal AC Input
- * 1, 2, and 5 Channel Supplies Available

Description	Stock No.
1-Channel Standard	UNI57629
2-Channel Standard	UNI57630
5-Channel Standard	UNI58425
1-Channel TE Cooled	UNI59146
6' BNC Cable	UNI38903

Specifically designed for our photodiode receiver modules, these power supplies offer a low-noise, dual polarity output. Removable power cord included. TE Cooled detectors require a different power supply which powers not only the amplifier but the cooler as well. Dimensions for 1,2 and 5 channel power supplies (LxWxH) 7.0" x 6.0" x 2.75". Power Supply for TE cooled modules dimensions (LxWxH) 9.0" x 6.0" x 2.75".

Photodiode Receiver Modules

Detector Dia.	Operating Wavelengths (nm)	Photodiode Receiver Modules	NEP @ Peak ($\times 10^{-14}$ W/Hz ^{1/2})	Noise (V/Hz ^{1/2}) Low / High Gain	Bandwidth (-3dB) Hz Low / High Gain	Stock No.
VIS Si						
1.0mm	300-1000	$0.5 \times 10^9/10^8$	<1.0	$5 \times 10^{-6}/10^{-7}$	DC-500 / DC-2000	UNI57622
2.5mm	300-1000	$0.5 \times 10^9/10^8$	<1.0	$5 \times 10^{-6}/10^{-7}$	DC-500 / DC-2000	UNI57623
5.0mm	300-1000	$0.5 \times 10^8/10^7$	<2.5	$1.3 \times 10^{-6}/10^{-7}$	DC-2000	UNI57625
5.0mm TE Cooled*	300-1000	$0.6 \times 10^9/10^8$	<1.0	$5 \times 10^{-6}/1 \times 10^{-6}$	DC-500 / DC-2000	UNI59142
10.0mm	300-1000	$0.6 \times 10^8/10^7$	<1.5	$1.0 \times 10^{-5}/10^{-6}$	DC-2000	UNI57627
UV Si						
2.5mm	200-1000	$5 \times 10^9/10^8$	<1.0	$5 \times 10^{-6}/10^{-7}$	DC-500 / DC-2000	UNI57624
5.0mm	200-1000	$5 \times 10^8/10^7$	<3.0	$1.3 \times 10^{-6}/10^{-7}$	DC-2000	UNI57626
5.0mm TE Cooled*	200-1000	$5 \times 10^9/10^8$	<1.0	$5 \times 10^{-6}/1 \times 10^{-6}$	DC-500 / DC-2000	UNI59144
10.0mm	200-1000	$6 \times 10^8/10^7$	<1.5	$1.0 \times 10^{-6}/10^{-5}$	DC-2000	UNI57628
NIR InGaAs						
1.0mm	800-1700	$0.9 \times 10^9/10^8$	<2.0	$15 \times 10^{-6}/1.5 \times 10^{-6}$	DC-500 / DC-2000	UNI59198
3.0mm	1000-1700	$0.9 \times 10^8/10^7$	<6.0	$5.5 \times 10^{-6}/10^{-7}$	DC-2000	UNI57782
3.0mm TE Cooled*	800-1600	$0.9 \times 10^9/10^8$	<1.0	$8 \times 10^{-6}/1 \times 10^{-6}$	DC-2000	UNI59141
Extended InGaAs						
1.0mm	1200-2600	$0.9 \times 10^6/10^5$	<500.0	$5 \times 10^{-6}/0.5 \times 10^{-5}$	DC-2000	UNI59723
1.0mm TE Cooled*	1200-2500	$1.2 \times 10^6/10^5$	<50.0	$6 \times 10^{-8}/0.3 \times 10^{-9}$	DC-2000	UNI59724
3.0mm	1200-2600	$1.0 \times 10^5/10^4$	<750.0	$7.5 \times 10^{-7}/10^{-8}$	DC-2000	UNI59725
3.0mm TE Cooled*	1200-2500	$1.2 \times 10^6/10^5$	<100.0	$1.8 \times 10^{-6}/10^{-7}$	DC-2000	UNI59726
PbSe						
2.0mm TE Cooled*	1000-4500	$2 \times 10^6/10^5$	<1000.0	$2 \times 10^{-5}/10^{-6}$	5-10000	UNI59728
PbS-Photo Conductor Receiver Module						
2.0mm TE Cooled*	1000-2800	$2 \times 10^7/10^6$	<100.0	$2 \times 10^{-5}/10^{-6}$	5-400	UNI59727

Segmented Photodiodes



- * High Stability Over Temperature and Time
- * Excellent Resolution, High Accuracy, Ultra-Low Dark Current
- * Two or Four Separate Active Area Segments

Segmented Photodiodes are designed for a wide variety of applications that require high stability and fast response times. Featuring position resolutions of greater than 0.1 μ m, Segmented Photodiodes are ideal for surface profiling, position measurement, alignment, or targeting. Segmented Photodiodes are segmented into either two or four separate active areas and have spectral response ranges from 350-1100nm. The segmented regions allow various measurement profiles on a single detector.

Segmented Photodiodes

Active Area (mm ²)	Active Area Size (mm)	Element Gap (mm)	Responsivity (A/W) @ 970nm		Capacitance (pF) @ -10V	Dark Current (nA) @ -10V		NEP (W/Hz ^{1/2}) @ -10V, 970nm	Max. Reverse Voltage (V)	TR (nsec) -10V/50 Ω , 780nm	Operating Temp (°C)	Storage	Package Style	Stock No.
			Min.	Typ.		Typ.	Max.							
Two-Element Segmented Photodiodes														
3.3	1.3x2.5	0.127	0.6	0.65	11	0.15	2	1.1×10^{-14}	30	5	-40 to 100	-55 to 125	41 / TO-5	UNI84609
0.7	0.6x1.2	0.013	0.6	0.65	3	0.05	1	6.2×10^{-15}	30	7	-40 to 100	-55 to 125	41 / TO-5	UNI84610
2.8	0.6x4.6	0.025	0.6	0.65	7	0.13	2	9.9×10^{-15}	30	4	-40 to 100	-55 to 125	41 / TO-5	UNI84611
Four-Element Segmented Photodiodes														
1.61	1.3x1.3	0.127	0.6	0.65	5	0.1	1	8.7×10^{-15}	30	3	-40 to 100	-55 to 125	41 / TO-5	UNI84612
0.25	0.5x0.5	0.013	0.6	0.65	1	0.01	0.5	2.8×10^{-15}	30	3	-40 to 100	-55 to 125	41 / TO-5	UNI84614
19.6	10 Dia.*	0.102	0.6	0.65	60	0.5	10	1.9×10^{-14}	30	3	-40 to 100	-55 to 125	43 / LoProf	UNI84615
19.6	10 Dia.*	0.01	0.6	0.65	60	0.5	10	1.9×10^{-14}	30	3	-40 to 100	-55 to 125	43 / LoProf	UNI84616
UV-Element Segmented Photodiodes														
1.61	1.3sq.	0.127	0.08	0.1	40	100	500	1.3×10^{-13}	5	10	-10 to 60	-20 to 70	41 / TO-5	UNI84613

Typical Specifications @ 23°C

DUV Photodiodes

- * High Stability Over Temperature and Time
- * Excellent Resolution, High Accuracy, Ultra-Low Dark Current
- * Two or Four Separate Active Area Segments

Operating Temp (°C)	-20 to +60
Storage Temp (°C)	-55 to +80
Metal Housing	-55 to +80
Ceramic Housing	-20 to +80



DUV Photodiodes are ideal for a wide variety of applications, including UV spectrophotometry and analytical and medical instrumentation. DUV Photodiodes are designed for enhanced responsivity from 200 – 400nm, and with sensitivity extending down to 190nm. DUV Photodiodes feature quartz windows and either metal or ceramic housing. Models with suppressed NIR performance are also available.

DUV Photodiodes

Housing Type	Active Area (mm ²)	Active Area Size (mm)	Peak Wavelength (nm)	Responsivity (A/W)			Capacitance (pF) @ 0V	Shunt Resistance (G Ω) @ -10mV		NEP (W/Hz ^{1/2}) @ 0V, 200nm	Rise Time (μ s) @ 0V, 1k Ω	Package Style	Stock No.
				200nm	633nm	980nm		min.	typ.				
Standard Models													
Metal	5.7	2.4 x 2.4	980	0.12	0.33	0.5	65	0.3	1	3.6×10^{-14}	0.2	2/TO-5	UNI84981
Metal	13	3.6 x 3.6	980	0.12	0.33	0.5	150	0.2	0.8	4.1×10^{-14}	0.5	2/TO-5	UNI84983
Metal	34	5.8 x 5.8	980	0.12	0.33	0.5	380	0.1	0.4	5.8×10^{-14}	1	2/TO-5	UNI84984
Ceramic	5.7	2.4 x 2.4	980	0.12	0.33	0.5	65	0.3	1	3.6×10^{-14}	0.2	4/Ceramic	UNI84982
Ceramic	34	5.8 x 5.8	980	0.12	0.33	0.5	380	0.1	0.4	5.8×10^{-14}	1	4/Ceramic	UNI84985
Ceramic	100	10.0 x 10.0	980	0.12	0.33	0.5	1100	0.04	0.2	8.2×10^{-14}	3	4/Ceramic	UNI84986
Suppressed NIR Models													
Metal	5.7	2.4 x 2.4	720	0.12	0.34	0.36	140	2	20	8.2×10^{-14}	0.5	2/TO-5	UNI84596
Metal	13	3.6 x 3.6	720	0.12	0.34	0.36	280	1	10	1.1×10^{-14}	1	2/TO-5	UNI84598
Metal	34	5.8 x 5.8	720	0.12	0.34	0.36	800	0.5	5	1.6×10^{-14}	2	3/TO-8	UNI84599
Ceramic	5.7	2.4 x 2.4	720	0.12	0.34	0.36	140	2	20	8.2×10^{-14}	0.5	4/Ceramic	UNI84597
Ceramic	34	5.8 x 5.8	720	0.12	0.34	0.36	800	0.5	5	1.6×10^{-14}	2	4/Ceramic	UNI84600
Ceramic	100	10.0 x 10.0	720	0.12	0.34	0.36	2500	0.2	2	2.6×10^{-14}	7	4/Ceramic	UNI84602

Typical Specifications @ 23°C



InGaAs Avalanche Photodiode Modules



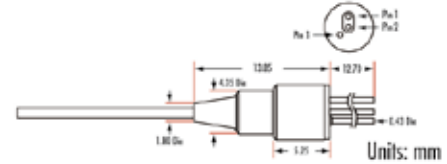
- * Spectral Response from 800 – 1700nm
- * Ideal for Biomedical, Industrial, and Telecommunication Applications
- * Multi-Mode and Single-Mode Fibers Available

InGaAs Avalanche Photodiode Modules are designed for a variety of low light level detection or signal transmission applications. These photodiode modules are ideal for industrial, telecommunication, or biomedical applications such as optical coherence tomography.

InGaAs Avalanche Photodiode Modules feature low dark currents, low back reflections, high speed 2 GHz bandwidths, and small sizes for easy system integration, in addition to fast recovery times from optical overload.



InGaAs Photodiode



Active Area Diameter	75 μ m	Capacitance	1pF
Spectral Response	800 - 1700nm	Bandwidth	2GHz
Fiber Connection	FC/PC	Noise Equivalent Power	3.7×10^{-14} W/Hz ^{1/2}
Responsivity	0.75 A/W @1550nm	Reverse Current (Max)	3mA
Dark Current	5.6nA	Forward Current (Max)	5mA
Breakdown Voltage (V_{br})	37V	Optical Return Loss	-30dB
dV_{br}/dT	17mV / °C	Operating Temperature	-40 to 85°C

Pinout Assignments

Description	Nominal Fiber Size (μ m)	Fiber Type	Stock No.
Single Mode	9/125/245/900	SMF 28e	UNI87321
Multi Mode	50/125/245/900	GI MMF	UNI87322

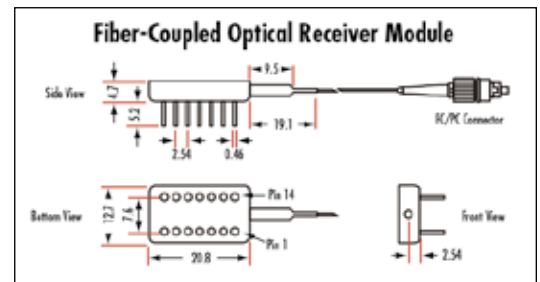
Pin	Function
1	Anode
2	Cathode
3	Ground

Fiber-Coupled Optical Receiver Modules



- * High Sensitivity and Overload Power with Wide Dynamic Range
- * Designed for Bandwidths of 3MHz and 120MHz and Wavelength Ranges of 1310–1550nm
- * Ideal for Biomedical, Industrial, or Telecommunication Optical Sensor Systems

Fiber-Coupled Optical Receiver Modules are ideal for use in biomedical optical sensor systems or for industrial and telecommunication sensing applications. Fiber-Coupled Optical Receiver Modules feature high sensitivity and high overload power, in addition to wide dynamic ranges. These receiver modules are designed for use in common telecommunication wavelength ranges.



Pin Assignments

Pin	Function
1	-5V detector bias
2, 6, 9, 11	No connection
12, 13, 14	No connection
3, 5, 8	Ground
4	-5V (LDFR = NC)
7	Output
10	+5V

Fiber-Coupled Optical Receiver Modules

Description	Nominal Fiber Size (μ m)	Fiber Connection	Sensitivity (dBm)	Dynamic Range (dB)	Spectral Response (nm)	Stock No.
3 MHz Optical Module	50/125/245/900	FC/PC	-56	53	1310-1550	UNI87323
120 MHz Optical Module	50/125/245/900	FC/PC	-42	25	1310-1550	UNI87324



Current Amplifiers

- * Variable Gain
- * High Speed and Low Noise Designs
- * Bias Voltage Adjustment
- * Compact EMI-Shielded Case
- * BNC Input and Output



High Speed Current Amplifier (UNI59179)

Standard Current Amplifier (UNI57988)

These pre-amplifier modules are current-to-voltage conversion amplifiers used to amplify small currents from a photodiode or photomultiplier with very low noise.

UNI57988 consists of a single stage DC-coupled transimpedance amplifier with three switchable gains. A bias pin allows the user to apply a reverse bias voltage in series with the photodiode. The amplifiers plugs directly into the 1-channel low noise power supply UNI57629 (power supply sold separately).

UNI59178 is a two stage low-noise transimpedance amplifier featuring switchable AC/DC-coupling, adjustable bias voltage and offset, switchable 10Hz lowpass filter and the capability of manual and opto-isolated remote control.

UNI59179 is a two-stage high-speed transimpedance amplifier featuring switchable AC/DC-coupling, adjustable offset for baseline correction, adjustable bias voltage for use with fast photodiodes, switchable 10 MHz and 1 MHz low pass filters and the capability of manual and opt-isolated remote control.

Each of these modules has BNC input and output connections for easy integration between the Data Acquisition System's Terminal Block or oscilloscope and detector. This makes system design and configuration effortless with using detectors with a BNC connection.

Stock No.	UNI57988	UNI59178	UNI59179
Transimpedance Gain:	HI: 10MΩ; MID: 1MΩ; LO: 100KΩ	10^3 to 10^{11} Ω (adjustable in decade steps)	10^2 to 10^8 Ω (adjustable in decade steps)
Bandwidth (-3dB):	HI: DC-2kHz; MID: DC-20kHz; LO: DC-200kHz	500KHz max.	200MHz max.
Input Current Noise (A/Hz):	HI: 4.0×10^{-14} ; MID: 1.2×10^{-13} ; LO: 4.0×10^{-13}	See datasheet on our website	See datasheet on our website
Bias Voltage:	Applied via external bias pin	±10V, max., 22mA, Adjustable by trimpot or external control voltage	Adjustable by trimpot or external control voltage
Offset Adjustment:	N/A	Adjustable by trimpot or external control voltage	Adjustable by external control voltage
Remote Control:	No	Yes	Yes
Case Size:	25.4mmL x 50.8mmW x 25.4mmH	150mmL x 55mmW x 44mmH	150mmL x 55mmW x 40mmH
Operating Temperature:	0 to 60°C	0 to 60°C	0 to 60°C
Power Supply (not included):	±5 to ±15V DC 20mA; 9-pin D-sub connector	±15V, +110mA/-90mA	±15V, +110mA/-90mA
Weight:	117g (0.26lbs)	320g (0.74 lbs)	320g (0.74lbs)

High Speed Current Amplifiers

Description	Stock No.
Variable Gain Standard Current Amplifier	UNI57988
Variable Low Noise Current Amplifier	UNI59178
Variable Gain High Speed Current Amplifier	UNI59179
110V Power Supply for UNI59178/UNI59179	UNI59180
220V Power Supply for UNI59178/UNI59179	UNI59181
1-Channel Power Supply for UNI57988	UNI57629

Photodiode Amplifier

- * **1 Part in 20,000 Resolution**
- * **Full Scale Input Range of $\pm 20\text{nA}$ to $\pm 20\text{mA}$**
- * **Variable Bias Selectable from -14V to $+14\text{V}$**
- * **RS-232 Serial Interface**

This amplifier unit is a low noise, high gain, transimpedance amplifier that is designed to provide a direct digital readout of the current generated from a photodiode, photomultiplier, or similar current source. If a reading in Watts is desired, simply toggle the A/W setting. By adjusting the A/W setting on the amplifier to equal detector responsivity, the amplifier can measure the incident optical power. For detectors that require a reverse bias, the unit can apply a selectable bias in series with the photodetector.



An output voltage port provides a $\pm 2\text{V}$ full-scale analog signal directly proportional to the LCD display reading. Use this port to route the signal to either an oscilloscope (UNI59539) or a data acquisition board. For noise-sensitive measurements, the unit can be disconnected from its external supply and powered from its internal batteries. Battery low indicator is activated on the LCD when batteries need recharging via included power supply. Universal power supply includes wall connectors for US, UK, Europe and Australia. RS-232 & Power cables included.

Max. Input Without Damage	$\pm 25\text{mA}$	Frequency Response (-3dB)	20nA: DC to 2.0 kHz, 100nA: DC to 5.25 kHz, 2 μA : DC to 22 kHz, 20 μA , 200 μA , 2mA, 20mA: DC to 40 kHz
Full Scale Ranges	$\pm 20\text{nA}$ to 20mA in decade steps	Display	4 ^{1/2} digit, 0.4" high LCD
A/W Setting	0.100 to 1.0000 in 0.005 increments; Defaults to 1 when not engaged	Power Requirements	Rechargeable NiMH batteries w/ approx. 10 hours of use
Output Impedance	100 Ω	External Supply	85 to 260 V AC, 50-60 Hz universal supply, 10W max.
Bias Voltage	Selectable -14V to $+14\text{V}$ in 7mV increments; Defaults to 0 when not engaged	Dimensions	5.5"W x 2.5"H x 8.5"L
Offset Control	Offsets the display by up to $\pm 20,000$ counts	Operating Temperature	0° to 40°C
Noise	<1pA p-p, DC-1kHz with <10pF Detector capacitance		

Description	Stock No.
Photodiode Amplifier	UNI57601

Ge Photodiodes

- * Large and Small Area
- * Wide Performance Range
- * TE Coolers and Two-Color Sandwich
- * Filtered Windows for High Power Available
- * Standard and Custom Packages/Submounts



TYPE	ACTIVE DIA. (mm.)	SHUNT RES. @ $V_r=10\text{mV}$ (K Ω) MIN. TYP.		DARK CURRENT @ $V_r=V_{\text{test}}$ (μA MAX)	TEST REVERSE BIAS (Volts)	MAX REVERSE VOLTS	CAPACITANCE @ V_r -MAX (pF)	NEP ($\text{pW}/\sqrt{\text{Hz}}$)	CUT-OFF FREQ. @ V_r , 50 Ω R $_L$ (MHz)
GM2	0.5 SQ	30	60	2	10	15	27	1	120
GM2HS		100	150	1	3	5	110	0.3	30
GM2VHS		250	350	0.7	0.3	0.5	300	0.2	10
GM2VHR		550	900	0.5	0.3	0.5	300	0.1	10
GM3	0.1	120	180	1	10	15	1	0.3	3000
GM3HS		350	500	0.3	3	5	6	0.1	500
GM3VHS		1500	2500	0.1	0.3	0.5	21	0.1	150
GM3VHR		2000	3000	0.1	0.3	0.5	21	0.1	150
GM4	0.3	60	80	1.5	10	15	10	0.6	300
GM4HS		250	400	0.4	3	5	50	0.3	60
GM4VHS		400	650	0.2	0.3	0.5	200	0.2	16
GM4VHR		900	1600	0.2	0.3	0.5	200	0.15	16
GM5	1.0	20	40	3	10	15	85	1.5	35
GM5HS		60	100	1.5	2	3	300	0.5	10
GM5VHS		200	280	0.5	0.3	0.5	1450	0.3	2
GM5VHR		330	450	0.5	0.3	0.5	1450	0.3	2
GM6	2.0	6	12	10	10	15	300	2	17
GM6HS		30	60	3	2	3	1200	0.8	1
GM6VHS		80	120	1	0.3	0.5	9000	0.4	0.6
GM6VHR		120	200	1	0.3	0.5	9000	0.4	0.6
GM7	3.0	4	8	30	5	10	800	3	4
GM7HS		25	35	4	1	3	4000	1	0.7
GM7VHS		40	65	3	0.25	0.5	13000	0.6	0.2
GM7VHR		65	90	2	0.25	0.5	13000	0.6	0.2
GM8	5.0	2	4	40	3	5	3000	4	1.6
GM8HS		10	15	15	1	3	6000	2	0.5
GM8VHS		15	20	5	0.1	0.3	35000	1	0.1
GM8VHR		20	30	5	0.1	0.3	35000	1	0.1
GM10HS	10 SQ.	2.0	3.5	50	0.5	1	30000	4	0.1
GM13HS	13	1	2.0	100	0.5	1	50000	8	0.05
GM5TEC1	1.0		300	0.2	5	7	85	0.4	55
GM8TEC2	5.0		60	1	1	2	3000	1	1.6

VHS series: Designed for zero reverse bias applications requiring high shunt resistance.

VHR series: Designed for zero reverse bias applications.

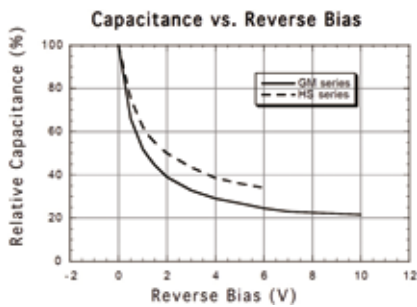
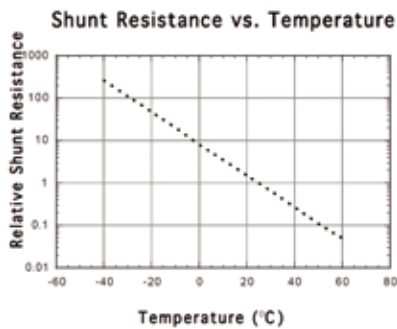
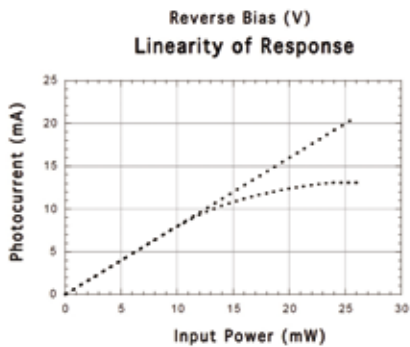
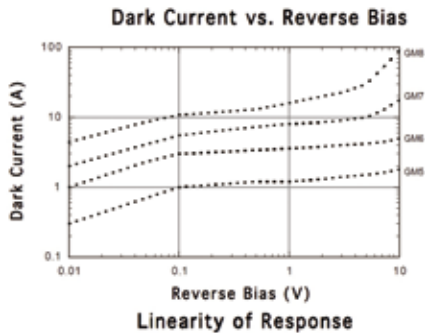
HS series: Designed for < 5V reverse bias applications.

GM series: Designed for high speed applications with reverse bias > 10V.

TEC series: Mounted on a one- or two-stage thermoelectric cooler for low-noise applications.



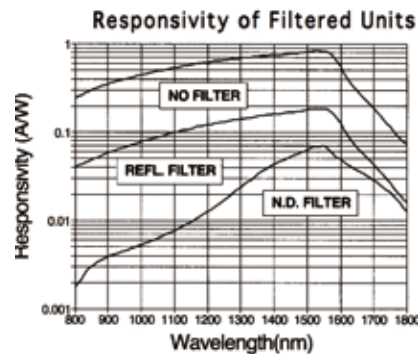
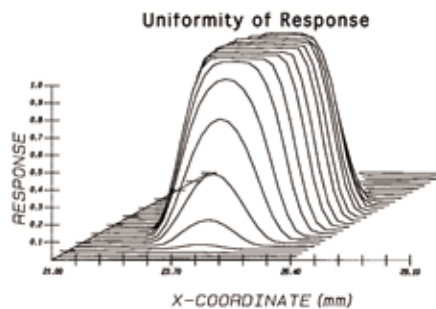
Electrical Specifications



Optical Specifications

Responsivity vs. Wavelength

Series	WAVELENGTH					
	850		1300		1550	
	min.	typ.	min.	typ.	min.	typ.
GM	.20	.26	.60	.65	.75	.85
GMHS	.20	.26	.60	.70	.75	.85
GMVHS	.20	.26	.60	.70	.80	.85
GMVHR	.26	.32	.70	.80	.82	.87



Special Options

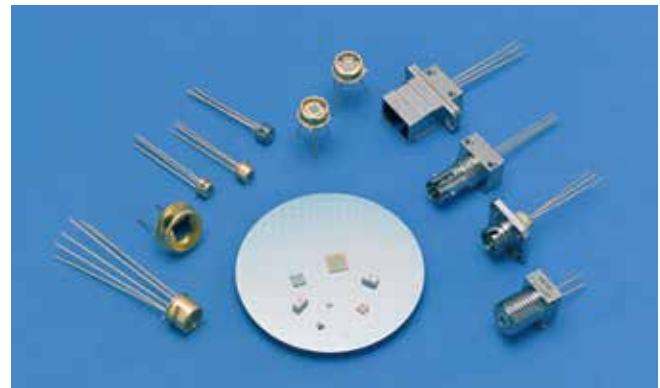
- * High response at short wavelength available
- * BNC connectors
- * Thermoelectric coolers (1- and 2-stage)
- * Neutral density filters
- * Bandpass Filters
- * AR-coated lenses/windows
- * Custom devices including arrays
- * Calibrated spectral response

Si/Ge Two-Color Detector: Electrical Specifications

Type	Active Dia. (mm)	Wavelength Range (nm)	Peak Resp. (A/W)	NEP (pW/√Hz)	R _{SHUNT} (KΩ)	Max Reverse Volts (V)	Leakage Current	Forward Voltage (V) I _{PH} =10mA
(Si) GM6Si5	5	400 - 1000	0.5	1.0x10 ⁻¹⁴	>1000	30	2nA	1.1
(Ge)	2	1000 - 1800	0.6	1.0x10 ⁻¹²	60	3	2 μA	0.45
(Si) GM7Si5	5	400 - 1000	0.5	1.0x10 ⁻¹⁴	> 1000	30	2 nA	1.1
(Ge)	3	1000 - 1800	0.6	1.5x10 ⁻¹²	25	3	3μA	0.45
(Si) GM8Si5	5	400 - 1000	0.5	1.0x10 ⁻¹⁴	> 1000	30	2 nA	1.1
(Ge)	5	1000 - 1800	0.6	2.0x10 ⁻¹²	10	1.5	10μA	0.45

High Speed InGaAs Photodiodes

- * High Responsivity
- * Low Dark Current
- * Low Capacitance : High Speed
- * Planer Design for High Reliability

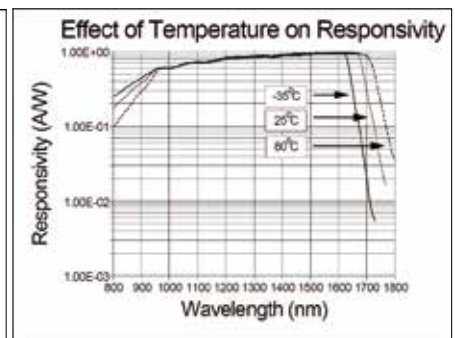
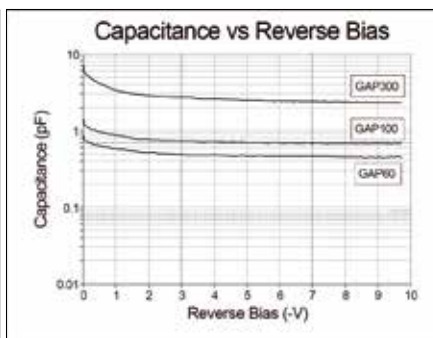
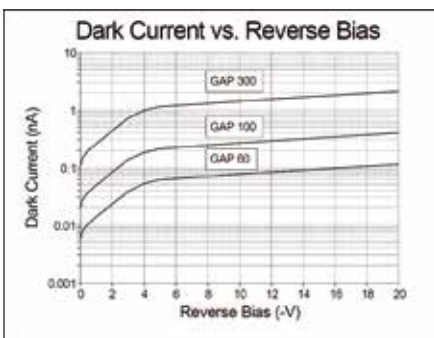


Electrical Characteristics @ 25 °C

	GAP60/CS	GAP75	GAP100	GAP300	
Active Diameter	60	75	100	300	μm
Responsivity @	850nm	0.10 (0.20)	0.10 (0.20)	0.10 (0.20)	A/W min. (typ.)
	1300nm	0.80 (0.90)	0.80 (0.90)	0.80 (0.90)	A/W min. (typ.)
	1550nm	0.95	0.95	0.95	A/W min.
Dark Current @ 5V	0.8 (0.3)	0.8 (0.3)	1.0 (0.5)	5.0 (1.0)	nA max. (typ.)
Capacitance @ 5V	0.7(0.5)/0.5(0.3)-CS		0.8 (0.6)	1.2 (1.0)	8.0 (4.0)
Bandwidth 50 -3dB	6/10-CS		10	3	0.8
Rise/Fall time RL = 50Ω	0.06/0.03-CS		0.07	0.1	0.4
NEP @ 1550 nm	1.00E-15		1.00E-15	1.30E-15	1.80E-15
Case Style (standard)	TO-46(mod)/CS-1		TO-46(mod)	TO-46(mod)	TO-46(mod)

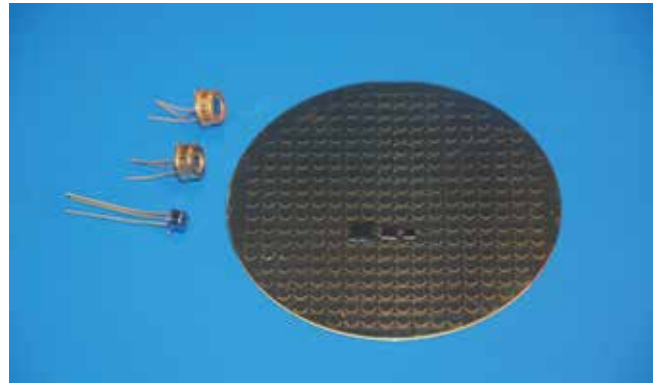
Maximum Ratings

	GAP60/CS	GAP75	GAP100	GAP300	
Storage Temperature	-40 to 125	-40 to 125	-40 to 125	-40 to 125	°C
Operating Temperature	-40 to 85	-40 to 85	-40 to 85	-40 to 85	°C
Reverse Voltage	25	25	25	25	V
Reverse Current	1	10	10	25	mA
Forward Current	10	10	10	100	mA



Large Area InGaAs Photodiodes

- * High Responsivity
- * High Shunt Resistance
- * Low Capacitance : High Speed
- * Planar Design for High Reliability

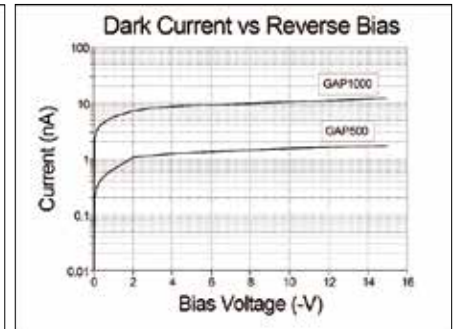
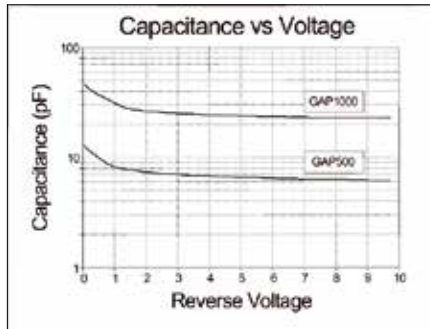
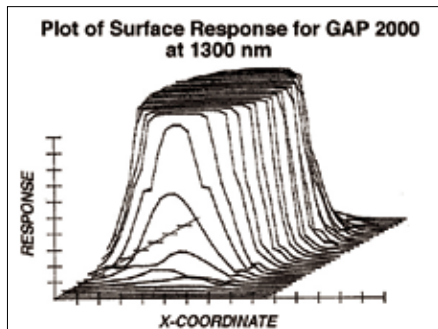
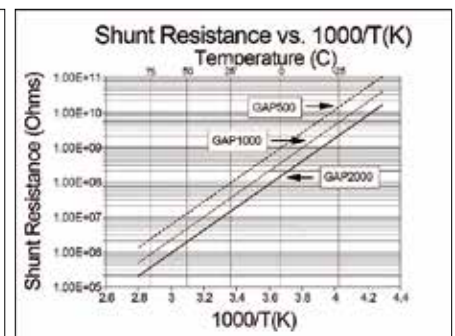
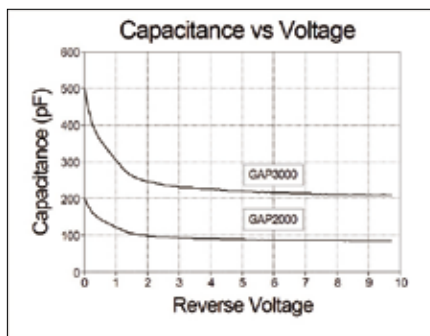
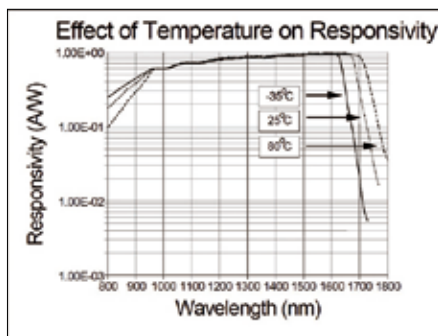


Electrical Characteristics @ 25 °C

	GAP500	GAP1000	GAP2000	GAP3000	GAP5000
Active Diameter (mm)	0.5	1.0	2	3	5
Responsivity @ 850nm	0.10 (0.20)	0.10 (0.20)	0.10 (0.20)	0.10 (0.20)	0.10 (0.20)
AW min. (typ.)1300nm	0.80 (0.90)	0.80 (0.90)	0.80 (0.90)	0.80 (0.90)	0.80 (0.90)
1550nm	0.9 (0.95)	0.9 (0.95)	0.9 (0.95)	0.9 (0.95)	0.9 (0.95)
Dark Current nA max. (typ.)	30 (6) @5V	100 (25) @5V	200 (50) @1V	500 (200) @1V	10μA (5μA) @0.3V
CJ @ 0V pF max (typ.)	40 (20)	120 (80)	500 (300)	1000 (600)	2500 (1800)
CJ @ -5V pF max (typ.)	10 (8)	50 (30)	150 (100) @-3V	300 (250) @-2V	900 (750) @ -1V
Bandwidth MHz 50 W -3dB	400 (5V)	100 (5V)	30 (3V)	12 (2V)	4.0 (1V)
Tr RL=50W ns (typ.)	1.0 (5V)	3.0 (5V)	10 (3V)	30 (2V)	90 (1V)
RS MW min (typ.)	50 (125)	20 (50)	5 (30)	2.0 (8)	1.0 (1.5)
NEP (1550 nm)pW/√Hz min.	0.02	0.03	0.06	0.1	0.14
Linear range (±0.2dB) dBm	8.0 (5V)	8.0	6.0	6.0	6.0
Case Style (standard)	TO-46 (mod.)	TO-46 (mod.)	TO-5	TO-5	TO-8

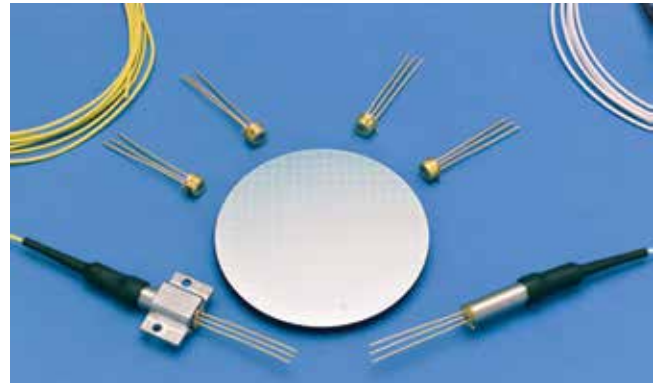
Maximum Ratings

	GAP500	GAP1000	GAP2000	GAP3000	GAP5000
Storage Temperature °C	-40 to 125	-40 to 125	-40 to 125	-40 to 125	-40 to 125
Operating Temperature °C	-40 to 85	-40 to 85	-40 to 85	-40 to 85	-40 to 85
Reverse Voltage V	20	20	3	2	2
Reverse Current mA	10	10	10	10	10
Forward Current mA	10	10	10	10	10
Power Dissipation mW	100	100	50	50	50



Ge Avalanche Photodiode

- * OTDR
- * Infrared
- * Telecommunications
- * Optical Communications
- * Short Haul Telecom/Datacom Receivers



Electrical Characteristics @ 25 °C

	GAV40	Units
Quantum Efficiency (peak)	72 (80)	% min. (typ.)
Responsivity @1300 nm	0.76 (0.84)	A/W min. (typ.) M=1
Breakdown Voltage *	20 / 30 / 40	V min./typ./max.
Dark Current @0.9Vb	0.2 (0.10)	μA max. (typ.)
Capacitance @ 20V **	1.0 (0.8)	pF max. (typ.)
Multiplied Dark Current	12	typ. M=1
Cutoff Frequency (-3dB)	1.5 (2.0)	GHz min. (typ.)
Excess Noise Figure	0.95 BW=1MHz M=10 Iph=2mA typ.	
Excess Noise Factor	9 @1300 nm, f=300MHz typ.	
Temperature Coefficient of Vb	0.1 % / °C	

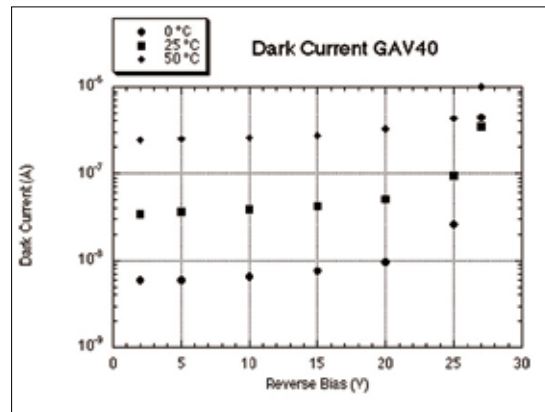
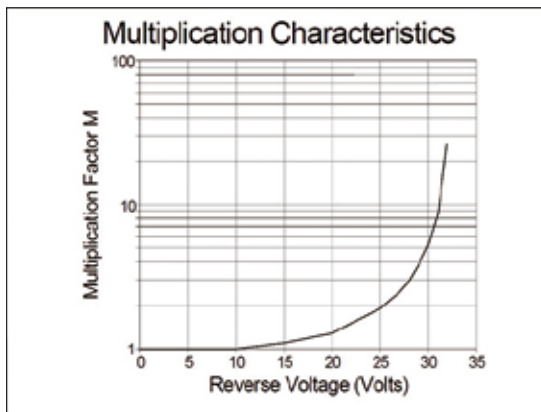
*I_R=100mA ** f=1MHz

Physical Specification

	GAV40
Active Diameter (μm)	40
Case Styles	TO-46 (modified)/TO-46 SM and MM pigtail, active mounts and ceramic substrates

Maximum Ratings

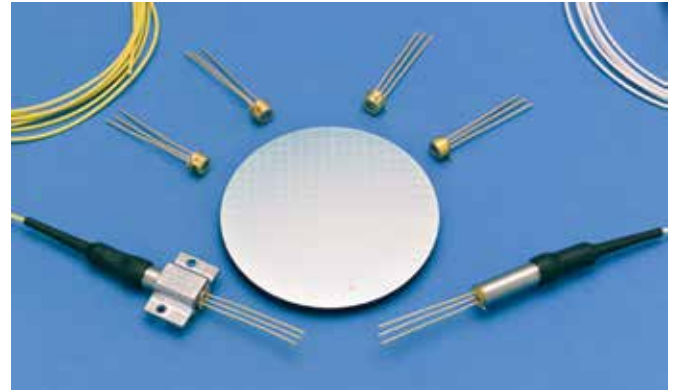
	GAV40	Units
Storage Temperature	-40 to 85	°C
Operating Temperature	-10 to 60	°C
Reverse Current	0.4	mA
Forward Current	80	mA



InGaAs Avalanche Photodiodes

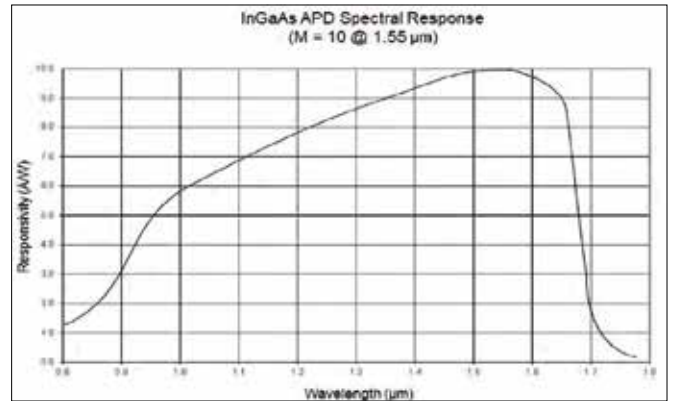
Features

- * Active Diameter (80 μ m to 350 μ m)
- * 900nm to 1650nm Spectral Response
- * Linear Operation
- * Low Dark Current for High Sensitivity
- * Low Capacitance for High Speed
- * Fiber Pigtail (Single or Multi Mode) including Hi-Reliability or Hi-Rel Pigtail
- * Packages (TO-46 and Sub-mount with Ball Lens Option)



Applications

- * Free Space Optics (FSO)
- * LIDAR/LADAR
- * High Sensitivity Photometry
- * Optical Communications
- * Optical Time Domain Reflectometer (OTDR)



Electrical Characteristics@23°C±2°C

Performance Specification	1AV80	1AV200	1AV350	Units
Active Diameter	80	200	350	μ m
Wavelength Range	1.0 - 1.63	1.0 - 1.63	1000 - 1630	μ m
Responsivity@M=1@1.55 μ m	0.85 min 0.90typ 0.95max	0.85 min 0.94typ 1.05max	0.85 min 0.90typ 0.95max	A/W
Dark Current@M=10	4typ 15max	8typ 25max	30typ 250max	nA
Operating Voltage, V _R @M=10	43min 55typ 70max	43min 55typ 70max	37min 52typ 68max	V
Breakdown Voltage, V _{BR} (ID=10 μ A)	40min 65typ 80max	50min 63typ 75max	45min 60typ 75max	V
Capacitance@M=10	0.35min 0.38typ 0.45max	1.8typ 2.2max	3.2typ 4.0max	pF
V _{BR} temperature coefficient	0.06typ	0.075typ 0.08max	0.075typ	V/C
Bandwidth@M=5	2min 2.5typ 3max	0.5min 1.5typ 2max	0.6typ	GHz
Bandwidth@M=10	1min 1.5typ 2max	1min 1.5typ 2max	0.6typ	GHz
Bandwidth@M=20	1.5min 2.2typ 2.5max	0.5min 1typ 1.5max	0.6typ	GHz
Excess Noise Factor, F@M=10	3.2typ 3.7max	3.2typ 3.7max	3.2typ 3.7max	
Excess Noise Factor, F@M=20	5.5typ 6max	5.5typ 6max	5.5typ 6max	
Noise Equivalent Power, @M=10	10typ 40max	32typ 100max	80typ 100max	fW/Hz ^{1/2}
Package	TO-46 window cap	TO-46 window cap	TO-46 window cap	

Maximum Ratings

Performance Specification	IAV80	IAV200	IAV350	Units
Storage Temperature	-40 to 85	-40 to 85	-40 to 85	°C
Operating Temperature	-40 to 70	-40 to 70	-40 to 70	°C
Reverse Current	1	1	1	mA
Forward Current	10	10	10	mA
Optical Input Density(10 ns pulse width)	200	200	200	kW/cm ²
Optical Input(average)	1	1	1	mW

Biased Silicon Photodetector



Applications

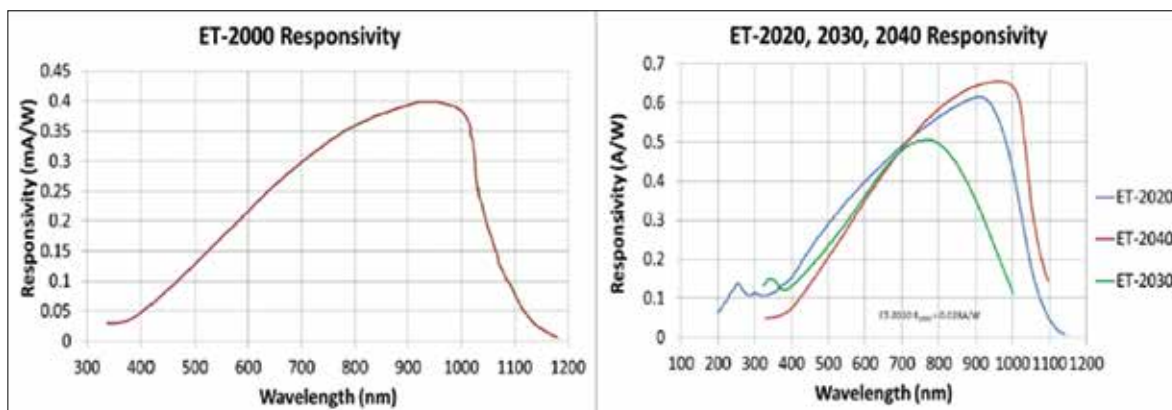
- * Monitoring the output of Q-switched lasers
- * Monitoring the output of mode-locked lasers
- * Monitoring the output of externally modulated CW lasers
- * Time domain and frequency response measurements

Features

- * Silicon photodetectors can be ordered with optional wall plug-in power supply
- * Available with optional FC or SMA input receptacle

Specifications

Part No. (Model)	120-10000-0001 (ET-2000)	120-10006-0001 (ET-2020)	120-10011-0001 (ET-2030)	120-10028-0001 (ET-2040)
Rise Time/Fall Time	<350ps / <350ps	<1.5ns / <1.5ns	<300ps / <300ps	<30ns / <30ns
Responsivity at 830nm	0.12mA / W	0.6A / W	0.47A / W	0.6A / W
Power supply (VDC)	3	24	9	24
Bandwidth	>1.0GHz	>200MHz	>1.2GHz	>25MHz
Active Area Diameter	110µm x 55µm	2.55mm	0.4mm	4.57mm
Dark Current (nA)	<0.11	<10	<0.1	<10
Acceptance Angle (1/2 angle)	20°	50°	30°	60°
Noise Equivalent power pW/√Hz)	<0.15	<0.09	<0.01	<0.09
Maximum Linear Rating	CW current: 20mA Energy per 10ns pulse: 20uJ	CW current: 2.5mA Energy per 10ns pulse: 15mA	CW current: 3mA Energy per 10ns pulse: 3mA	CW current: 2mA Energy per 10ns pulse: 3mW
Mounting (Tapped Holes)	8-32 or M4	8-32 or M4	8-32 or M4	8-32 or M4
Output Connector	BNC	BNC	BNC	BNC



Biased InGaAs Photodetector



Applications

- * Monitoring the output of Q-switched lasers
- * Monitoring the output of mode-locked lasers
- * Monitoring the output of externally modulated CW lasers
- * Time domain and frequency response measurements

Features

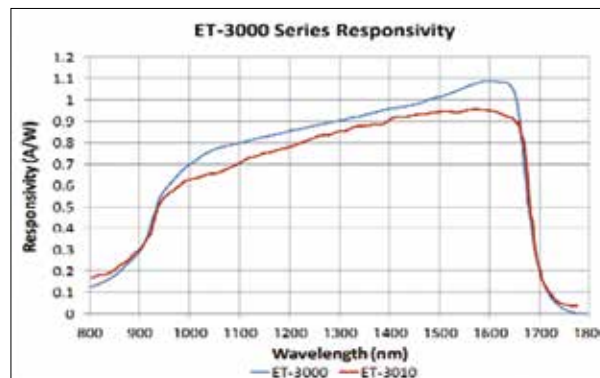
- * All Biased InGaAs photodetectors can be ordered with optional well plug-in power supply, except the ET-3020
- * Available with optional FC or SMA input receptacle

Specifications

Part No. (Model)	120-10034-0001 (ET-3000)	120-10050-0001 (ET-3010)	120-10054-0001 (ET-3020)	120-10056-0001 (ET-3040)
Rise Time/Fall Time	<175ps / <175ps	<175ps / <175ps	<6ns / <250ns	<1.25ns / <3.70ns
Responsivity at 1300nm (A/W)	0.9	0.85 ^a	0.9	0.9
Power supply (VDC)	6	6	Non-biased ^b	3
Bandwidth	>2GHz	>2GHz	>2.5MHz	>50MHz
Active Area Diameter	110μm	100μm	3.0mm	1mm
Dark Current (nA)	<2.0	<1.0	N/A	<10
Acceptance Angle (1/2angle)	20°	N/A	50°	50°
Noise Equivalent power pW/√Hz)	<0.03	<0.02	5	<0.06
Maximum Linear Rating	CW current: 5mA	CW current: 5mA	CW current: 5mA	CW current: 5mA
Mounting (Tapped Holes)	8-32 or M4	8-32 or M4	8-32 or M4	8-32 or M4
Output Connector	BNC	BNC	BNC	BNC

^a Coupling loss from FC receptacle.

^b Operates in photovoltaic mode.



>12.5GHz Photodetector



Applications

- * Monitoring the output of Q-switched lasers
- * Monitoring the output of mode-locked lasers
- * Monitoring the output of externally modulated CW lasers
- * Time domain and frequency response measurements

Features

- * >12.5GHz GaAs and InGaAs Photodetectors can be ordered with optional wall plug-in power supply

Specifications^a

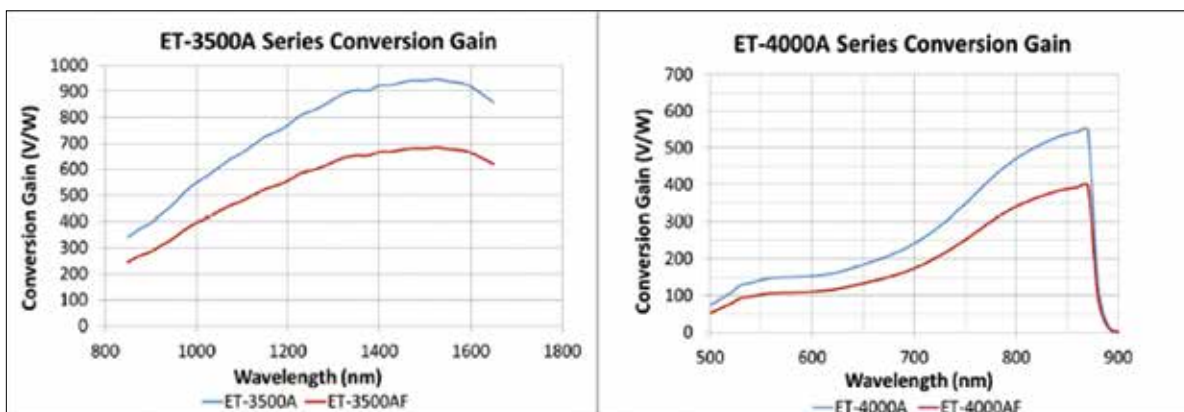
Part No. (Model)	120-10058-0001 (ET-3500)	120-10068-0001 (ET-3500F)	120-10071-0001 (ET-4000)	120-10081-0001 (ET-4000F)
Detector Material	InGaAs	InGaAs	GaAs	GaAs
Rise Time/Fall Time (ps)	<25 / <25	<25 / <25	<30 / <30	<30 / <30
Responsivity (A/W) ^b	>0.9 at 1300nm	>0.65 at 1300nm	0.53 at 830nm	0.38 at 830nm
Power Supply (VDC)	6	6	3	3
Bandwidth	>15GHz	>15GHz	>12.5GHz	>12.5GHz
Active Area Diameter	32µm	32µm	60µm	60µm
Dark Current (nA)	<3	<3	<0.5	<0.5
Acceptance Angle (1/2 angle)	15°	N/A	15°	N/A
Noise Equivalent power (pW/√Hz) ^c	<0.03 at 1300nm	<0.05 at 1300nm	<0.02 at 830nm	<0.03 at 830nm
Maximum Linear CW Power (mW)	10	10	10	10
Mounting (Tapped Holes)	8-32 or M4	8-32 or M4	8-32 or M4	8-32 or M4
Output Connector	SMA	SMA	SMA	SMA
Fiber Optic Connection ^d	N/A	FC/UPC, SMF28	N/A	FC/UPC, SMF28

^a All specifications apply for a 50Ω termination unless otherwise noted.

^b Photodetectors have an internal 50Ω termination. Responsivity data applicable to diode only. Detector output should be determined based on 1/2 the responsivity of that shown on graph.

^c Noise Equivalent Power (NEP) determined via short circuit output.

^d Multi-mode fiber available. May limit bandwidth.



<2GHz Amplified Photodetector



Applications

- * Monitoring high repetition rate, externally modulated CW lasers
- * Viewing <1mW laser powers

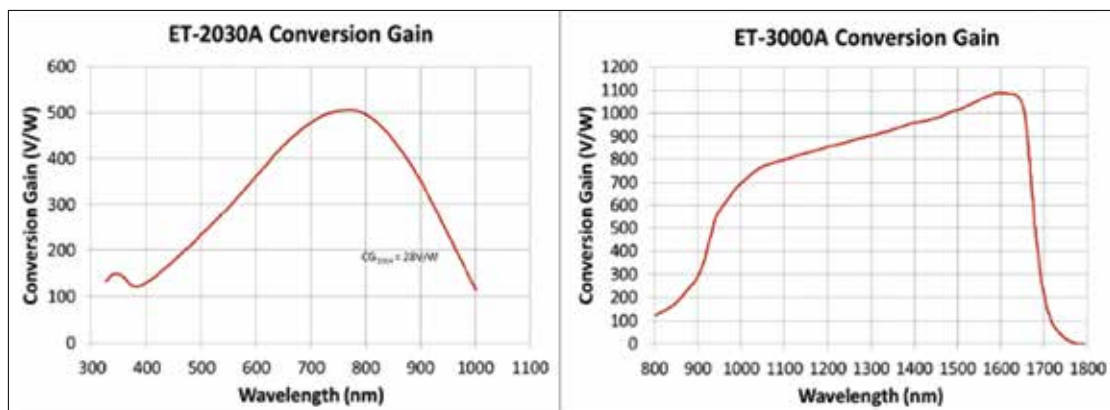
Features

- * Built-in transimpedance amplifier
- * Optical FC input receptacle available

Specifications^a

Part No. (Model)	120-10013-0001 (ET-2030A)	120-10036-0001 (ET-3000A)
Detector Material	Silicon	InGaAs
Rise Time/Fall Time (ps)	<500 / <500	<400 / <400
Conversion Gain	450 V/W at 830 nm	900 V/W at 1300nm
Power supply (VDC)	24	24
Bandwidth	30kHz – 1.2GHz	30kHz – 1.5GHz
Active Area Diameter	400µm	100µm
Acceptance Angle (1/2 angle)	10°	20°
Noise Equivalent power (pW/√Hz)	<60	<30
Maximum Linear Rating	1.3V peak	1.3V peak
Mounting (Tapped Holes)	8-32 or M4	8-32 or M4
Output Connector	BNC	BNC

^a Not suitable for CW applications.



9GHz Amplified Photodetector



Applications

- * Monitoring high repetition rate, externally modulated CW lasers
- * Viewing <1mW laser powers

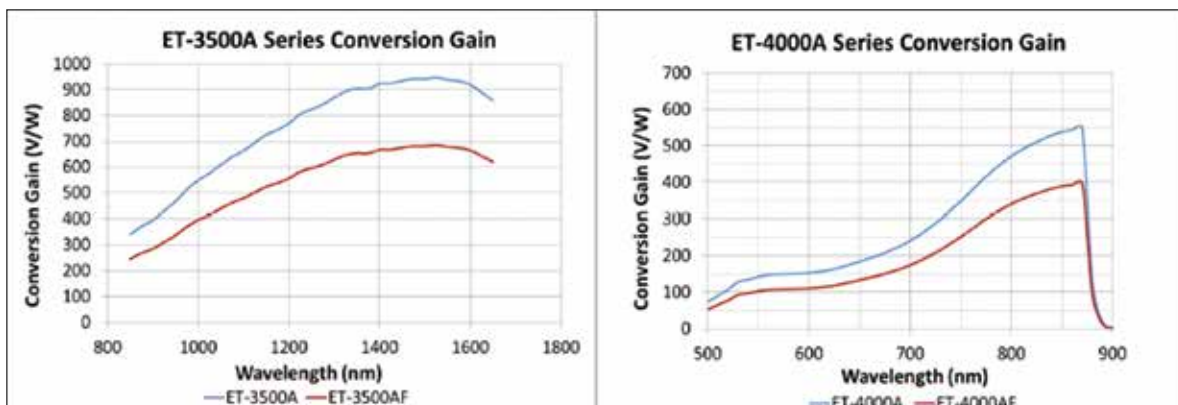
Features

- * Built-in transimpedance amplifier
- * Optical FC input receptacle available

Specifications^a

Part No. (Model)	120-10060-0001 (ET-3500A)	120-10064-0001 (ET-3500AF)	120-10073-0001 (ET-4000A)	120-10077-0001 (ET-4000AF)
Detector Material	InGaAs	InGaAs	GaAs	GaAs
Rise Time/Fall Time (ps)	<40 / <40	<40 / <40	<40 / <40	<40 / <40
Conversion Gain (V/W)	>900 at 1300nm	>650 at 1300nm	530 at 830nm	380 at 830nm
Power Supply (VDC)	5	5	5	5
Bandwidth	20kHz - 9GHz	20kHz - 9GHz	20kHz - 9GHz	20kHz - 9GHz
Active Area Diameter	32µm	32µm	60µm	60µm
Acceptance Angle (1/2 angle)	15°	N/A	15°	N/A
Noise Equivalent Power (pW/√Hz)	<25	<25	<45	<45
Maximum Linear Current (µA)	225	225	225	225
Current Monitor Output (mV/µA)	1	1	1	1
Maximum Linear Rating (mVp-p)	450	450	450	450
Mounting (Tapped Holes)	8-32 or M4	8-32 or M4	8-32 or M4	8-32 or M4
Output Connector	SMA	SMA	SMA	SMA
Fiber Optic Connection	N/A	FC/UFC, SMF28e	N/A	FC/UFC, SMF28e

^a Not suitable for CW applications.



>9GHz 2μm Amplified InGaAs Photodetectors



Applications

- * Monitoring high repetition rate, externally modulated CW lasers
- * Viewing <1mW laser powers

Features

- * Built-in transimpedance amplifier
- * Optional FC input receptacle available

Specifications^a

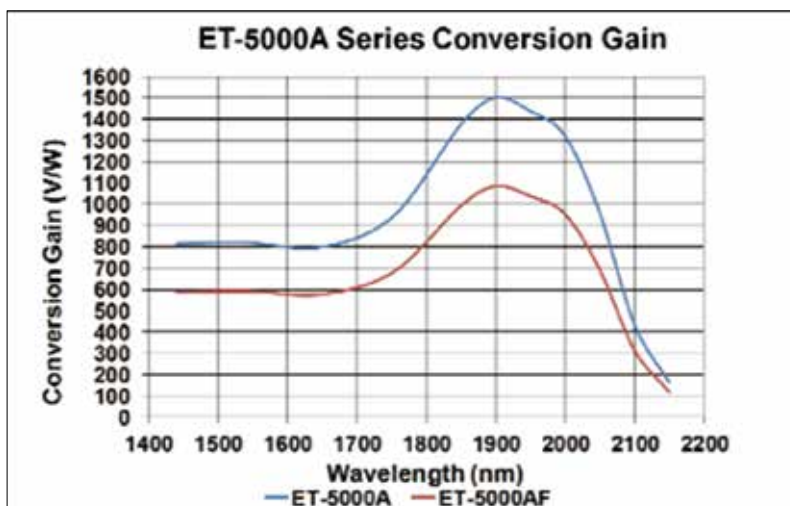
Part No. (Model)	120-10115-0001 ^b (ET-5000A)	120-10116-0001 ^b (ET-5000AF)
Rise Time/Fall Time (ps)	40/40	40/40
Conversion Gain (V/W)	1300 at 2000nm	950 at 2000nm
Power Supply (VDC)	5	5
Bandwidth	20kHz - 9GHz	20kHz - 9GHz
Active Area Diameter (μm)	40	40
Acceptance Angle (1/2 angle)	20°	N/A
Noise Equivalent Power (pW/√Hz) ^c	<17 at 2000nm	<17 at 2000nm
Maximum Linear Rating (mVp-p)	450	450
Mounting (Tapped Holes)	8-32 or M4	8-32 or M4
Output Connector	SMA	SMA
Fiber Optic Connection ^d	N/A	FC/UPC

^a All specifications apply for a 50Ω termination unless otherwise noted.

^b RoHS compliant.

^c Noise Equivalent Power (NEP) determined via short circuit output.

^d Multi-mode fiber available. May limit bandwidth.



>12.5GHz 2μm High Speed InGaAs Photodetectors



Applications

- * Monitoring the output of Q-switched lasers
- * Monitoring the output of mode-locked lasers
- * Monitoring the output of externally modulated CW lasers
- * Time domain and frequency response measurements

Features

- * >12.5GHz 2μm Photodetectors can be ordered with optional wall plug-in power supply

Specifications^a

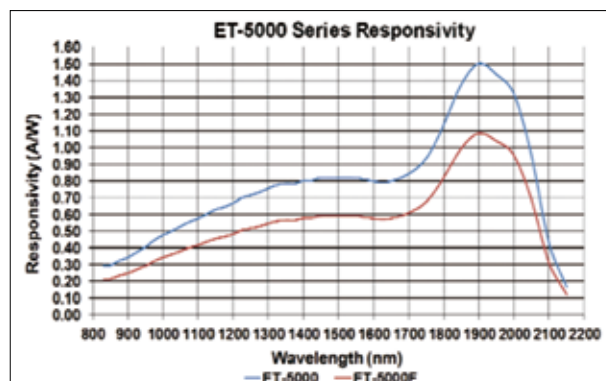
Part No. (Model) - Battery Bias	120-10105-0001 (ET-5000)	120-10104-0001 (ET-5000F)
Part No. (Model) - External Bias	120-10112-0001 (ET-5000EXT)	120-10100-0001 (ET-5000FEXT)
Rise Time/Fall Time (ps)	28	28
Responsivity (A/W at 2000nm) ^b	1.3	0.95
Power Supply	3V battery / 5V external	3V battery / 5V external
Bandwidth	>12.5GHz	>12.5GHz
Active Area Diameter (μm)	40	40
Dark Current (μA)	<1	<1
Acceptance Angle (1/2 angle)	20°	N/A
Noise Equivalent Power at 2.0μm (pW/√Hz) ^c	<0.44	<0.6
Maximum Linear Rating (mA) CW	3	3
Mounting (Tapped Hole)	8-32 or M4	8-32 or M4
Output Connector	SMA	SMA
Fiber Optic Connection ^d	N/A	FC/UPC

^a All specifications apply for a 50Ω termination unless otherwise noted.

^b Photodetectors have an internal 50Ω termination. Responsivity data applicable to diode only. Detector output should be determined based on 1/2 the responsivity of that shown on graph.

^c Noise Equivalent Power (NEP) determined via short circuit output.

^d Multi-mode fiber available. May limit bandwidth.



Photodetectors with Analog and TTL Outputs



Applications

- * Triggering applications with TTL output
- * Monitoring the output of Q-switched lasers
- * Monitoring the output of externally modulated CW lasers

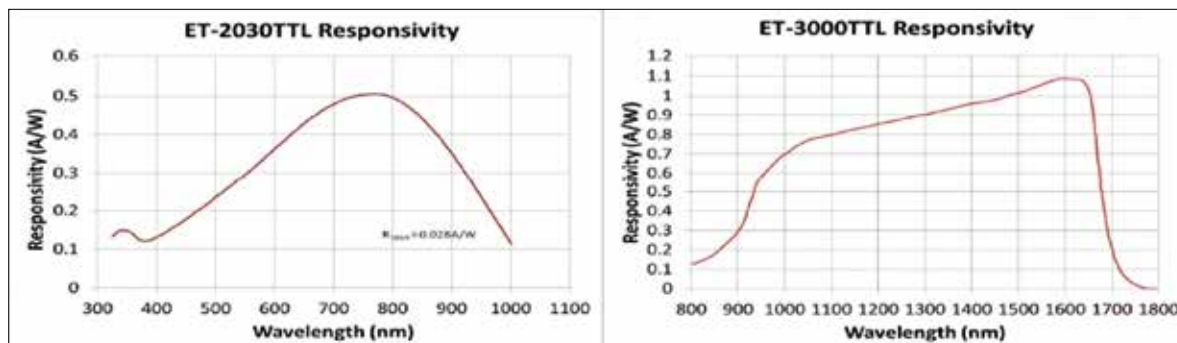
Features

- * Can generate analog or TTL output
- * Contains pulse stretch feature
- * Contains an adjustable trigger threshold

Specification

Part No. (Model)	120-10022-0001 (ET-2030TTL)	120-10044-0001 (ET-3000TTL)
Detector Material	Silicon	InGaAs
Power Supply (VDC)	12	12
Active Area (diameter)	400 μ m	100 μ m
Dark Current (nA)	<0.1	<2.0
Acceptance Angle (1/2 angle)	10°	20°
Noise Equivalent Power (pW/ \sqrt Hz)	<0.01	<0.03
Mounting (Tapped Holes)	8-32 and M4	8-32 and M4
Analog Output		
Rise Time/Fall Time (ps)	<300 / <300	<175 / <175
Responsivity	0.47 A/W at 830nm	0.9 A/W at 1300nm
Bandwidth	DC-1.2GHz	DC-1.2GHz
Maximum Linear Rating	CW and Pulse current: 3mA	CW current: 5mA CW power: 20mW
Termination	50 Ω external	50 Ω external
Output Connector	BNC	BNC
TTL Output		
Rise Time/Fall Time (ps)	<8 / <9	<8 / <9
Bandwidth	DC-60MHz	DC-60MHz
Termination (Ω)	500	500
Adjustable Trigger Threshold (mV)	40-500	40-500
Minimum Detection Pulsewidth (ns)	8	8
Logic High/Logic Low (V)	>3.0 / <0.5	>3.0 / <0.5
Puls Stretch (when enabled)	100ns typical	100ns typical
Output Connector	BNC	BNC

Product specifications and pricing subject to change without notice.



1.5-5 μ m PbSe Large Area Power Detector



The ET-6000 can be used to measure power from 1.0 μ m to 5.0 μ m, has a selectable gain of 2X or 100X, and an active area of 5mm x 5mm making alignment easy. Based on a photoconductor, the ET-6000 responds more quickly and reaches a stable state more quickly than a thermopile detector.

Applications

- * Power detection of QCLs
- * Power detection of DFBs

Features

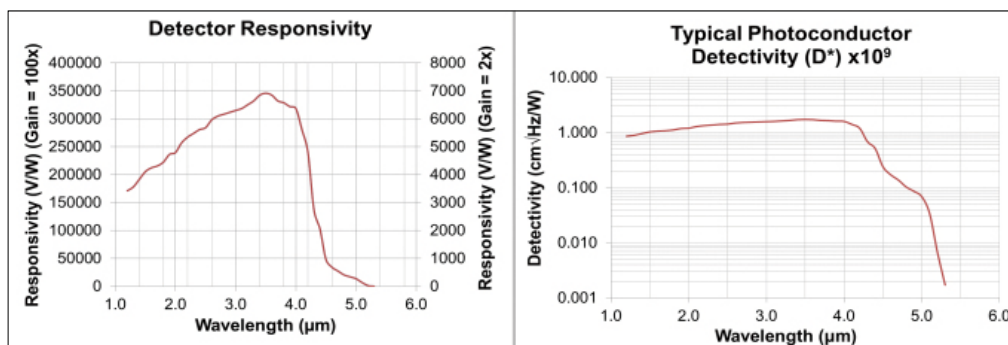
- * 2x and 100x gain select
- * PbSe photoconductor responds more quickly and reaches a stable state more quickly than a thermopile detector

Specifications^{ab}

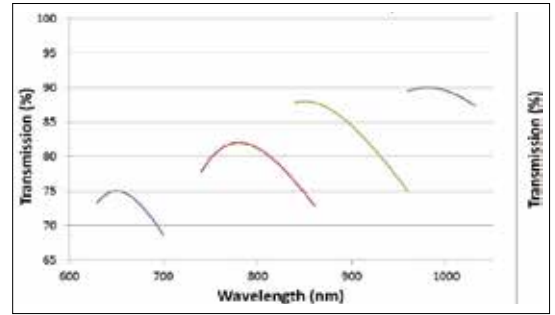
Part No. (Model)	120-10127-0001 (ET-6000)	
Detector Type	Photoconductor	
Gain	2x	100x
Rise Time/Fall Time (μ s)	32	25
Responsivity (High Impedance)	$>3.2 \times 10^5$ V/W at 3.5 μ m	$>3.2 \times 10^5$ V/W at 3.5 μ m
Responsivity (50 Ω Impedance)	$>1.6 \times 10^5$ V/W at 3.5 μ m	$>1.6 \times 10^5$ V/W at 3.5 μ m
Power Supply	24V external	24V external
Bandwidth	0.02kHz - 15kHz	0.02kHz - 10kHz
Active Area (mm x mm)	5 x 5	5 x 5
Detectivity (λ , 1000, 1)	$>1.5 \times 10^9$ cm \cdot \sqrt Hz/W	$>1.5 \times 10^9$ cm \cdot \sqrt Hz/W
Maximum Output (V)	\pm 11V	\pm 11V
Maximum Input Power	0.6mW/mm 2	0.6mW/mm 2
Operating Temperature ($^{\circ}$ C)	10-40	10-40
Acceptance Angle(1/2 angle)	20 $^{\circ}$	20 $^{\circ}$
Noise Equivalent Power at 2.0 μ m (pW/ \sqrt Hz)	400	450
Mounting (Tapped Holes)	8-32 or M4	8-32 or M4
Output Connector	BNC	BNC

^a All specifications apply for a 1,000Hz chopping frequency.

^b An optical chopper and lock-in amplifier are recommended for proper operation.



500-1030nm Wavelength Tunable Faraday Rotators and Isolators

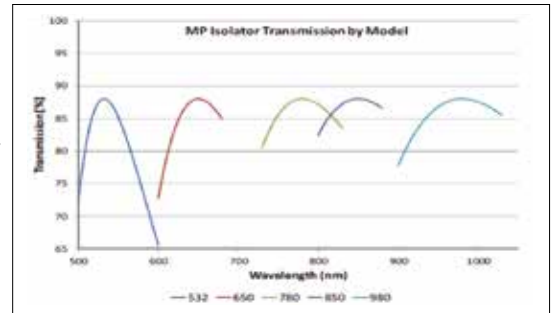


Benefits

- * Eliminate frequency instability in single frequency laser diodes
- * Eliminate parasitic oscillations due to ASE in amplified laser systems

Features

- * Wavelength tunability allows optimal isolation at a variety of wavelengths
- * Isolators centered at 650nm, 780nm, 850nm, and 980nm can be ordered with either dichroic glass polarizers or polarizing beam splitter cube polarizers
- * Optional $\lambda/2$ plate available for all isolators^a
- * Two isolators can be used in series to attain 60dB isolation which is often required for single frequency laser diodes



Specifications^b

Rotators

Center Wavelength (nm)	Isolation at 22°C (dB) ^d	Transmission at 22°C (%) ^e	Pulsed Damage Threshold
532	≥30	>97	3J/cm ² at 10ns
650	≥30	>98	3J/cm ² at 10ns
780	≥30	>98	3J/cm ² at 10ns
850	≥30	>98	3J/cm ² at 10ns
980	≥30	>98	3J/cm ² at 10ns

Isolators

Center Wavelength (nm)	Spectral Range (nm)	Isolation at 22°C (dB) ^f	Transmission at 22°C (%) ^e	Polarizer Type	Damage Threshold ^g
650	630 - 700	>30	>72.5	Dichroic Glass	25W / cm ² CW
780	740 - 860	>30	>82	Dichroic Glass	25W / cm ² CW
850	840 - 960	>30	>88	Dichroic Glass	25W / cm ² CW
980	960 - 1030	>30	>90	Dichroic Glass	25W / cm ² CW
532	500 - 600	>27	>88	PBS Cube	1J / cm ² at 10ns
650	600 - 680	>27	>88	PBS Cube	1J / cm ² at 10ns
780	730 - 830	>27	>88	PBS Cube	1J / cm ² at 10ns
850	800 - 880	>27	>88	PBS Cube	1J / cm ² at 10ns
980	950 - 1010	>27	>88	PBS Cube	1J / cm ² at 10ns

^a The addition of a waveplate may restrict wavelength range.

^b Product specifications are subject to change.

^c When placed between crossed polarizers having an extinction ratio of ≥ 1000:1

^d At center wavelength

^e When tuned for maximum isolation

^f Isolators with PBS cube polarizers have CW damage threshold of 2KW/cm².

Note: All products are RoHS compliant.

Model Number

AA	BB	C	DDDD	EEE	FFF
Product Type	Aperture Size (mm)	Device Type	Oper. Wavelength	Input Polarization	Output Polarization
WT-Rotator	4	R - Rotator	500-1030nm	000	000
LP-Low Power		I - Isolator		045	045
MP-Medium Power				090	090
				135	135

Example: Description: Medium Power 4mm isolator centered at 650nm; with a waveplate, input horizontal, output horizontal

Model Number: MP-04-I-650-000-000

1010-1080nm Faraday Rotators and Isolators



Benefits

- * Decouple Nd and Yb laser oscillators from ASE created by amplifiers
- * Eliminate relaxation on oscillations in mode-locked lasers due to optical feedback
- * Eliminate frequency instability in seed sources

Features

- * Product tested to >400W CW power 2° incident angle on polarizers for reduced insertion losses
- * Orthogonal isolated beams
- * Precision pointing of isolated beam
- * Precision mounting options
- * Lockable port covers
- * Optional $\lambda/2$ plate available for all isolators

Specifications^a

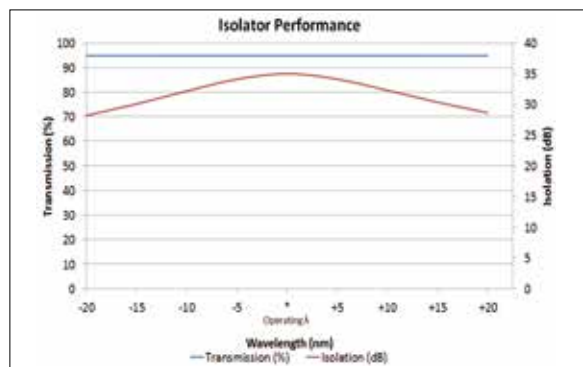
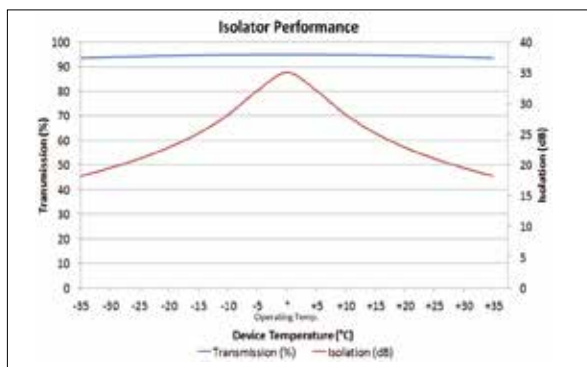
	1010-1080nm Rotator	1010-1045nm Isolator	1045-1080nm Isolator
Peak Transmission ^b	>98%	>95%	>95%
Peak Isolation ^b	N/A	>33dB	>33dB
Peak Rotation	45° ± 0.5°	45° ± 0.5°	45° ± 0.5°
Operating Temperature Range	-10 – 60°C	-10 – 60°C	-10 – 60°C
Tunable Temperature Range	10 – 30°C	10 – 30°C	10 – 30°C
Isolated Beam Pointing ^c	<5mrad	<5mrad	<5mrad
Damage Threshold ^b	10J / cm ² at 10ns 1J / cm ² at 8ps	10J / cm ² at 10ns 1J / cm ² at 8ps	10J / cm ² at 10ns 1J / cm ² at 8ps

^a Product specifications are subject to change.

^b At customer-specified wavelength and temperature

^c Input cube only

Note: All products are RoHS compliant.



Model Number

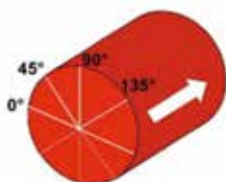
AA	B	CCCC	DDD	EEE
Aperture Size (mm)	Device Type	Oper. Wavelength	Input Polarization	Output Polarization
02	R - Rotator	1010-1045nm	000	000
05	I - Isolator	1045-1080nm	045 090 135	045 090 135

Example: Description: 5mm isolator centered at 1064nm with a waveplate; input horizontal, output horizontal
Model Number: 05-I-1064-000-000

Input Polarization Reference

Notes:

- 1) Light is rotated clockwise 45° from input to output for all catalog devices.
- 2) $\lambda/2$ waveplate available on output for arbitrary output polarizations, if required.



Broadband Faraday Rotators and Isolators for Ti:Sapphire Lasers

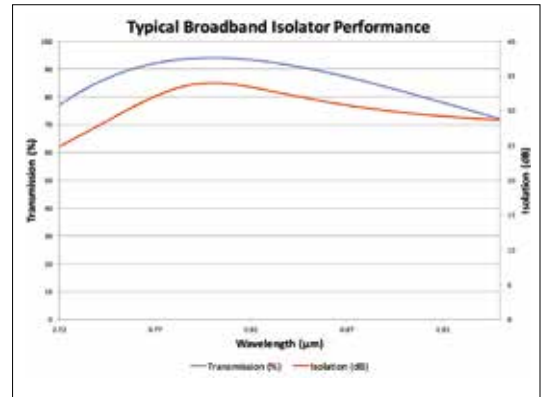


Benefits

- * Eliminate ASE from high-gain amplifiers that can cause parasitic or relaxation oscillations
- * Prevent preferential lasing at low-gain wavelengths by providing broadband isolation

Features

- * All devices are completely passive; no tuning is required
- * Combination of low refractive index optics and short optical pathlengths minimizes pulse broadening that can be associated with ultra-short pulses
- * All isolators contain escape ports; all rejected beams are deflected at 90°



Specifications^a

	Rotator	Isolator
Center Wavelength	800nm	800nm
Spectral Range	720 - 950nm	720 - 950nm
Polarizer Type	N/A	PBS Cube
Transmission at 22°C ^b	>98%	>92%
Isolation at 22°C	N/A	>30dB
Pulsed Damage Threshold ^c	5J / cm ² at 10ns	1J / cm ² at 10ns

^a Products specifications are subject to change

^b At center wavelength

^c CW damage threshold is 2kW/cm²

Note: All products are RoHS compliant.

Model Number

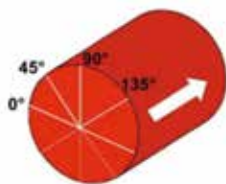
<u>A A</u>	<u>B B</u>	<u>C</u>	<u>D D D</u>	<u>E E E</u>	<u>F F F</u>
Product Type	Aperture Size (mm)	Device Type	Oper. Wavelength	Input Polarization	Output Polarization
BB	05	R - Rotator	800nm	000	000
	08			045	045
	10	I - Isolator		090	090
				135	135

Example: Description: 5mm isolator centered at 800nm; input horizontal, output vertical
Model Number: BB-05-I-800-000-090

Input Polarization Reference

Notes:

- 1) Light is rotated clockwise 45° from input to output for all catalog devices.
- 2) $\lambda/2$ waveplate available on output for arbitrary output polarizations, if required.



1050-1080nm Low Power Faraday Rotators and Isolators



Benefits

- * Decouple seed lasers from slave lasers
- * Eliminate frequency instability in single-frequency laser diodes due to optical feedback

Features

- * Compact size
- * Isolators can be ordered with either dichroic glass polarizers or polarizing beam splitter cube polarizers

Specifications^a

	Rotator	Isolator	
Polarizer Type	N/A	Polarcor	PBS Cube
Clear Aperture	1.5mm	1.5mm	1.5mm
Transmission at 22°C	≥78%	≥75%	≥75
Isolation at 22°C	N/A	≥30dB	≥30dB
Damage Threshold		500mW CW	1MW/cm ² at 10ns

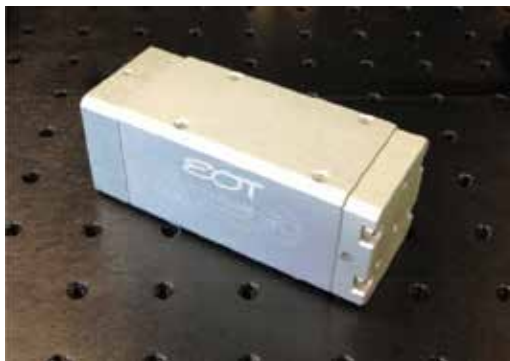
^aProduct specifications are subject to change.
Note: All products are RoHS compliant.

Model Number

A	B B B	D D D D	E E E
Aperture Size (mm)	Film Type	Oper. Wavelength	Polarizer Type
2	BIG-Bismuth Iron Garnet	1050-1080nm	ROT-Rotator (no polarization) POL-Polarcor PBS-PBS Cube

Example: Description: 2mm isolator centered at 1064nm PBS Cube polarizer
Model Number: 2BIG1064-PBS

Free Space Output Isolators for Yb:Fiber Lasers

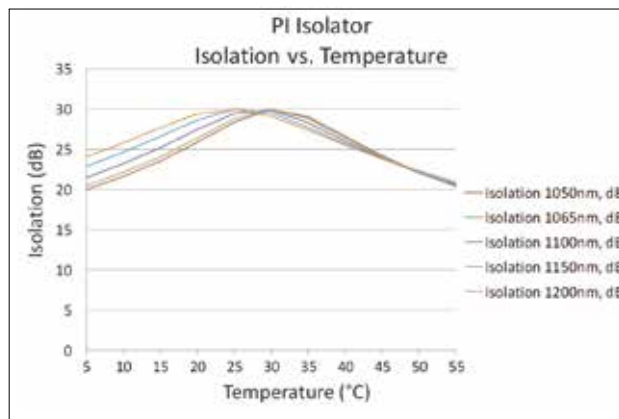


Benefits

- * Rugged, environmentally hardened assembly assures limited down time for marking systems due to laser problems
- * Minimal beam distortion results in clear, distinct part marking

Features

- * Available with protective fiber covering, either armor or furcation tubing
- * Critical components are designed to minimize return loss which can degrade laser performance
- * Proper steering and heat sinking of backward traveling light assures isolator performance does not degrade over time due to heating



Specifications^a

Clear Aperture	0.7mm	1.4mm
Operating Wavelength	1054 - 1074nm	1060 - 1080nm
Pulsed Damage Threshold	<5J / cm ² at 10ns	<5J / cm ² at 10ns
Beam Displacement	1mm	1.8mm
Pointing Accuracy	≤0.5°	≤0.5°
Average Power	30W	80W
Beam Diameter	≤0.35mm	≤0.7mm
Operating Temperature	10-50°C	10-50°C
Storage Temperature	0-60°C	0-60°C
Isolation at 23°C, 1064nm	>27dB	>27dB
Isolation over operating wavelength and	>20dB	>20dB
Transmission of light through fiber core ^b	>90%	>90%
Storage Humidity, non-condensing	0-90%	0-90%
Input Acceptance Angle	<1.0°	<1.0°

^a Product specifications are subject to change.

^b Transmission of light through fiber cladding is not included in the transmission specification.

Note: All products are RoHS compliant.

Model Number

<u>A A</u>	<u>B B</u>	<u>C</u>	<u>D D D D</u>
Product Type	Aperture Size (mm)	Device type	Oper. Wavelength
PI-Polarization Insensitive	0.7 1.4	I-Isolator	1054-1080nm

Example: Description: 1.4mm Polarization Insensitive isolator centered at 1064nm
Model Number: PI-1.4-I-1064

50W Fiber Laser Isolator



Benefits

- * Rugged, environmentally hardened assembly assures limited down time for marking systems due to laser problems
- * Minimal beam distortion results in clear, distinct part marking

Features

- * Critical components are designed to minimize return loss which can degrade laser performance
- * Proper steering and heat sinking of backward traveling light assures isolator performance does not degrade over time due to heating
- * Protective armor cabling for fiber is standard
- * U.S. Patent 7,306,376

Specifications^a

Part Number	110-10353-0001
Fiber Types ^b	Contact EOT
Maximum Incident Average Power	50W
Center Wavelength	1065nm ± 15
M ² Degradation	<10%
Standard Output Beam Diameter (1/e ² , mm)	7.5mm ± 1.5
Insertion Loss of light through fiber core ^c	<0.5dB
Isolation at 10-50°C	>20dB
Isolation at 30°C	>27dB
Return Loss	<-50dB
Reverse Power Handling ^d	50W for 30 min. max.
Maximum Pulse Energy	1mJ
Operating Temperature	10-50°C
Storage Temperature	0-60°C
Storage Humidity, non-condensing	10-90%

^a Product specifications are subject to change.

^b Standard fiber length is 3m, protective Teflon tubing length is 2.15m in a 2m armor cable jacket. Customers should contact EOT regarding other fiber requirements.

^c Insertion loss of light through fiber cladding is not included in the insertion loss specification.

^d Case temperature ≤ 50°C

Note: All products are RoHS compliant.

Note: It is recommended that the isolator be attached to the laser enclosure using a compression fitting that secures only the outer, metal reinforced jacket. The inner PTFE tube is meant as an abrasion barrier for the optical fiber and should be allowed to move freely with the fiber.

P800W Mode Stripping Fiber Collimator



EOT's Mode Stripping Collimators utilize EOT's patented monolithic mode stripping fiber ferrule/collimator technology. This technology minimizes optical loss while maintaining excellent beam quality and a high level of resistance to back reflections. This combination of features makes EOT's collimators excellent for many beam delivery applications.

Benefits

- * Mode stripping handles high levels of back reflection resulting in minimal downtime
- * Transmission loss is minimized assuring power to the work piece is maximized

Features

- * Customers may order either a complete fiber collimator or fiber ferrule
- * Available with protective fiber covering, either armor or furcation tubing

Specifications^a

Model	Polarizati on Insensitive	Polarizati on Maintaining
Application	CW or Pulsed	CW or Pulsed
Fiber Types ^b	Contact EOT	Contact EOT
Operating Wavelength	1020 - 1150nm	1020 - 1150nm
Insertion Loss	≤0.22dB	≤0.22dB
Pulsed Damage Threshold	2mJ/pulse at 10ns	2mJ/pulse at 10ns
Beam Diameter Fiber Dependent	3-6mm	3-6mm
Clear Aperture	13mm	13mm
Return Loss	<-47dB	<-47dB
Operating Temperature	0-70°C	0-70°C
Storage Temperature	-10-80°C	-10-80°C
Humidity, non-condensing	0-90%	0-90%
Forward P _{avg} Handling	≤800W	≤800W
Reverse P _{avg} Handling	≤50W	≤50W
Fiber Length	3m	3m

^a Product specifications are subject to change.

^b Customers should contact EOT regarding fiber requirements.

Note: All products are RoHS compliant.

Position Sensing Detector

What's a PSD

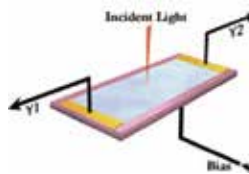
The PSD (Position Sensing Detector) is an opto-electronic device which converts an incident light spot into continuous position data. It provides outstanding resolution, fast response and excellent linearity, for a wide range of light intensities and simple operating circuits.

PSDs for every need

At SiTek we are able to meet the requirements for any type of high quality application; for existing measurement tasks as well as for new inventions in their development phase. We offer four different product groups: a standard series of 1-dimensional and 2-dimensional PSDs, the NT-series, and customised design PSDs.

1-Dimensional PSD

The one-dimensional PSD is able to detect a light spot moving over its surface in one dimension (a straight line). It has three terminals, one on the back side and two on the front side. The photoelectric current generated by the incident light flows through the device and can be seen as an input bias current divided into two output currents, Y1 and Y2. The relationship between these two output currents gives the light spot position through the formula



where L is equal to the length of the PSD. With this equation the intensity of the incident light spot does not affect the calculation of the light spot position. Examples of use of 1-dimensional PSDs are height and thickness measurement, wheel alignment, profile measurements, inspection of manufactured parts etc.

2-Dimensional PSD

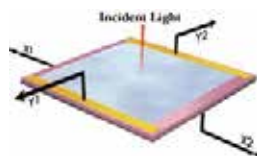
The two-dimensional PSD is able to detect a light spot moving over its surface in two dimensions. The duo-lateral PSD, which SiTek manufactures, has four terminals, two on the back side and two on the front side, where the terminals on the back side are placed perpendicular to the terminals on the front side. The photoelectric current generated by the incident light flows through the device and can be seen as two input currents, X1 and X2, and two output currents, Y1 and Y2. The relationship between the currents gives the light spot position through the formulas

$$\text{Position } y = \frac{L_y}{2} \cdot \frac{Y_1 - Y_2}{Y_1 + Y_2}$$

$$\text{Position } x = \frac{L_x}{2} \cdot \frac{X_1 - X_2}{X_1 + X_2}$$

where Ly and Lx is equal to the length of the PSD in the Y and X dimensions respectively. With these equations the intensity of the incident light spot does not affect the calculation of the light spot position. The separation of the two dimensions, unique to the duo-lateral PSD, ensures excellent linearity compared to other kinds of two-dimensional PSD.

Examples of use of 2-dimensional PSDs are position and motion monitoring in car crash analysis, robot check or anatomical studies, measurement of straightness, flatness, parallelism etc.



NT PSD

The presence of stray light from internal reflections in the measurement probe, from secondary reflections from the object (i.e. semi-transparent material), or from light scattered by smoke, dust etc. may cause problems. This is the major drawback in every light-based measurement technology. In 1995 SiTek introduced its patented solution with a new generation of PSDs which have an inherent stray light elimination. This means that you are now able to take full advantage of the PSDs high measurement speed and high resolution, even in applications where stray light has previously forced the use of other, inferior solutions.

The NT solution fits best for one-dimensional PSDs. Apart for the normal three terminals, it has an extra terminal on the front side. This extra terminal is connected to an extra active area on the PSD which will handle the disturbing stray light. By connecting this extra terminal to ground, the signal caused by the stray light will not interfere with the position signal. The position is calculated in exactly the same way as for the one-dimensional PSD by using the output currents Y1 and Y2.

Examples of use of NT PSDs are guiding robots during welding, measurement of the level of molten metal, inspection of semiconductor components etc.

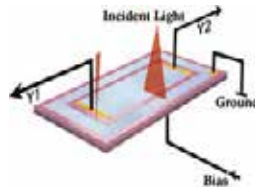
ES PSD (Enhanced-Sensitivity PSD)

The ES series of PSDs has a built in amplification of the light-generated photocurrent. As a matter of fact the ES-PSD is a large phototransistor contrary to the standard PSDs, which is a large area photodiode.

The amplified photocurrent in the ES-PSD is divided in the same fashion as the standard components and thus the position signal is calculated in exactly the same way. Any standard PSD can be directly replaced by a corresponding ES component.

Also, due to the larger internal capacitance in the ES component response speed will be somewhat lower.

The ES-PSD is mainly aimed for applications where low light intensities are used and where speed is not of primary concern. Such applications can for example be measurements performed on low reflectivity substances such as for example rubber or applications where the used light source intensity has to be limited due to health concerns.



ES PSD (Enhanced-Sensitivity PSD)

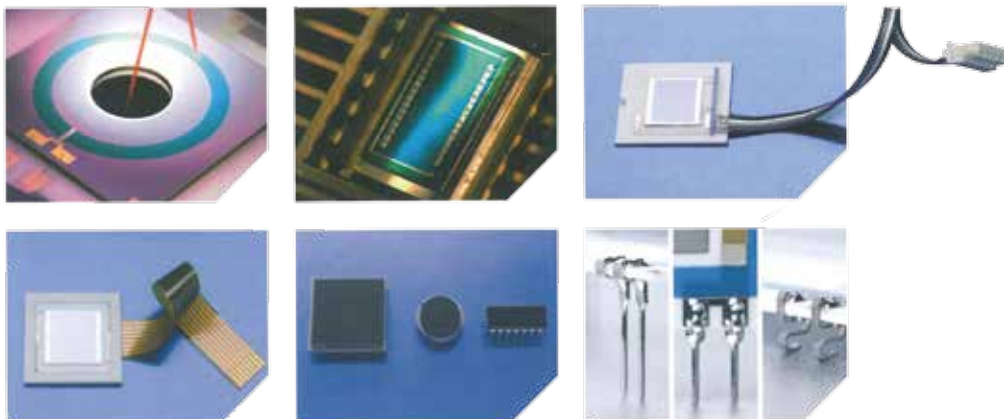
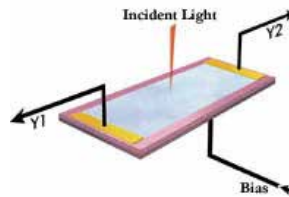
The ES series of PSDs has a built in amplification of the light-generated photocurrent. As a matter of fact the ES-PSD is a large phototransistor contrary to the standard PSDs, which is a large area photodiode. h is a large area photodiode.

The amplified photocurrent in the ES-PSD is divided in the same fashion as the standard components and thus the position signal is calculated in exactly the same way. Any standard PSD can be directly replaced by a corresponding ES component.

However, for a given light input the ES will give higher output currents and the connected electronics has to be designed to cope with this higher signal level.

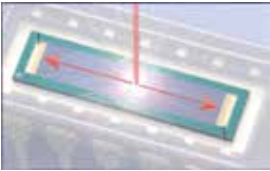
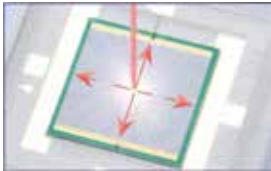
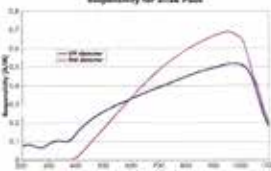
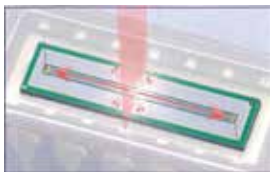
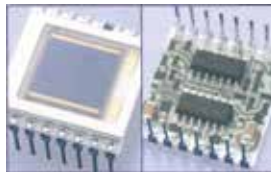
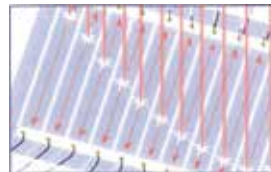
Also, due to the larger internal capacitance in the ES component response speed will be somewhat lower.

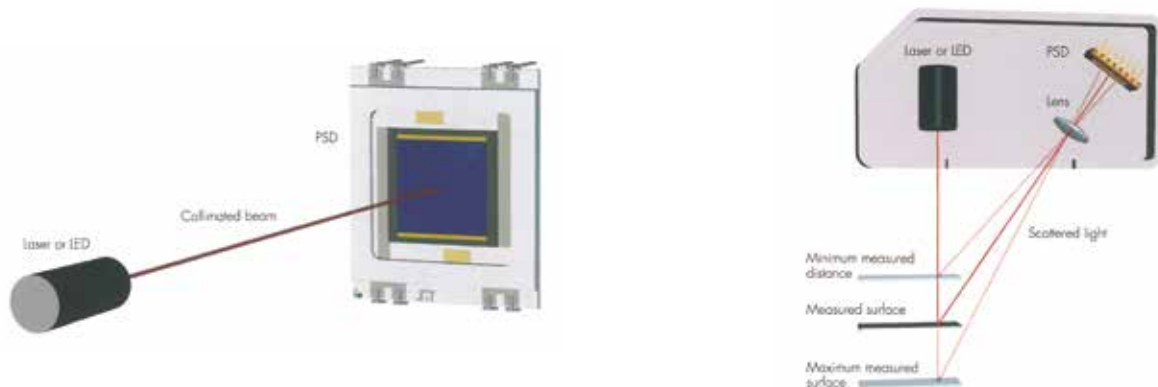
The ES-PSD is mainly aimed for applications where low light intensities are used and where speed is not of primary concern. Such applications can for example be measurements performed on low reflectivity substances such as for example rubber or applications where the used light source intensity has to be limited due to health concerns.



Position Sensing Detector Standard Selection Guide

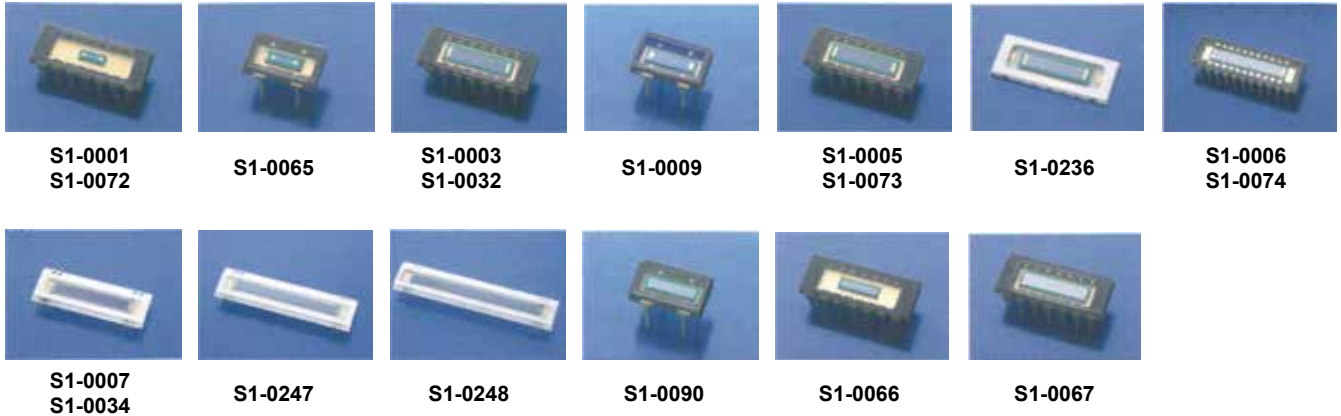
SiTek standard range offers a wide range of PSDs, with different functions and useful features some of them below. This gives an effective solution for SiTek's clients and a perfect starting point for product development.

1D – PSD	2D-PSD	UV-PSD
		
<p>SiTek high linearity 1D-PSD has three terminals, one on the back side and two on the front side.</p> <p>The photo current generated by the incident light flows through the device and can be seen as an input current divided into two output currents, Y1 and Y2.</p>	<p>The high linearity 2D-PSD is a duolateral PSD with four terminals, two on the back side and two on the front side, where the terminals on the back side are placed perpendicular to the terminals on the front side.</p> <p>The photo current generated by the incident light flows through the device and can be seen as two input currents, X1 and X2, and two output currents, Y1 and Y2.</p>	<p>The UV-PSD is optimized for highest performance in the UV wavelength region 200-400nm, although its spectral response reaches up to 1100nm.</p>
NT-PSD	SPC-PSD	PSD-Array
		
<p>The high linearity NT-PSD is especially suitable for applications where stray light causes problems.</p> <p>It has four terminals, one on the back side and three on the front side. The extra terminal is connected to an extra active area on the PSD which will handle the disturbing stray light. By connecting this extra terminal to ground, the signal caused by the stray light will not interfere with the position signal.</p>	<p>The high linearity SPC-PSD series offers PSDs equipped with attached signal processing circuits on the back side. Thick film technology and laser trimmed resistors ensures highest reliability and performance.</p> <p>The SPC electronics can easily be connected with any of SiTek's standard PSDs.</p>	<p>The PSD-Array consists of 16 parallel one dimensional PSD elements on the same chip.</p> <p>The photo current generated by the incident light flows through each element and can be seen as an inputs bias current divided into two output currents, Y1 and Y2. These currents can then be read out in parallel.</p>



Position Sensing Detector

1D-PSD



One-Dimensional PSD

Position non-linearity $\pm 0.1\%$			Detector resistance 50kohm				
Part.No.	Type	Active area (mm ²)	Leakage current (nA)	Noise Current $\mu\text{A}/\sqrt{\text{Hz}}$	Capacitance (pF)	Rise time (10-90%)(μs)	Package
S1-0001	1L2.5_CP2	2.5x0.6	2	0.4	1.6	0.03	14-pin DIL
S1-0065	1L2.5_CP1	2.5x0.6	2	0.4	1.6	0.03	4-pin DIL
S1-0003	1L5_CP2	5x1	4	0.4	5	0.05	14-pin DIL
S1-0009	1L5_CP1	5x1	4	0.4	5	0.05	4-pin DIL
S1-0005	1L10_CP2	10x2	8	0.4	15	0.2	14-pin DIL
S1-0236	1L10_SU70	10x2	8	0.4	15	0.2	SMD
S1-0006	1L20_CP3	20x3	60	0.5	45	0.5	22-pin DIL
S1-0007	1L30_SU2	30x4	150	0.7	90	1	Substrate
S1-0247*	1L45_SU69	45x3	110	0.4	105	2.7	Substrate
S1-0248**	1L60_SU34	60x3	150	0.4	135	4.5	Substrate

*Detector resistance 115kohm

**Detector resistance 150kohm

One-Dimensional PSD with Enhanced UV Respons

Position non-linearity $\pm 0.1\%$			Detector resistance 50 kohm				
Part.No.	Type	Active area (mm ²)	Leakage current (nA)	Noise Current $\mu\text{A}/\sqrt{\text{Hz}}$	Capacitance (pF)	Rise time (10-90%)(μs)	Package
S1-0072	1L2.5UV_CP2	2.5x0.6	2	0.4	1.6	0.03	14- pin DIL
S1-0032	1L5UV_CP2	5x1	4	0.4	5	0.05	14- pin DIL
S1-0073	1L10UV_CP2	10x2	8	0.4	15	0.2	14- pin DIL
S1-0074	1L20UV_CP3	20x3	50	0.5	45	0.5	14- pin DIL
S1-0034	1L30UV_SU2	30x4	150	0.5	90	1	Substrate

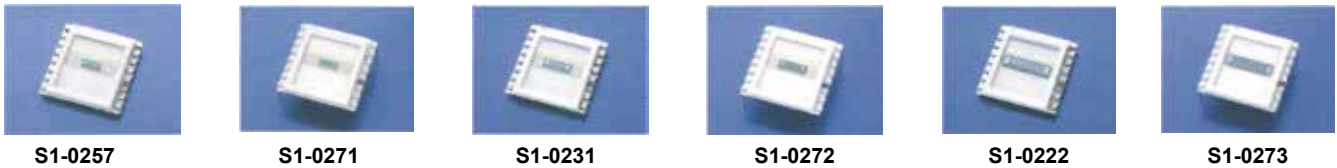
One-Dimensional PSD with Straylight Elimination – NT

One-Dimensional PSD with Straylight Elimination – NT

Position non-linearity $\pm 0.1\%$			Detector resistance 200 kohm				
Part.No.	Type	Active area (mm ²)	Leakage current (nA)	Noise Current $\mu\text{A}/\sqrt{\text{Hz}}$	Capacitance (pF)	Rise time (10-90%)(μs)	Package
S1-0090	1L5NT_CP1	5x0.25	4	0.3	5	0.25	4 pin DIL
S1-0066	1L5NT_CP2	5x0.25	4	0.3	5	0.25	14 pin DIL
S1-0067	1L10NT_CP2	10x0.5	8	0.3	15	0.7	14 pin DIL

Position Sensing Detector

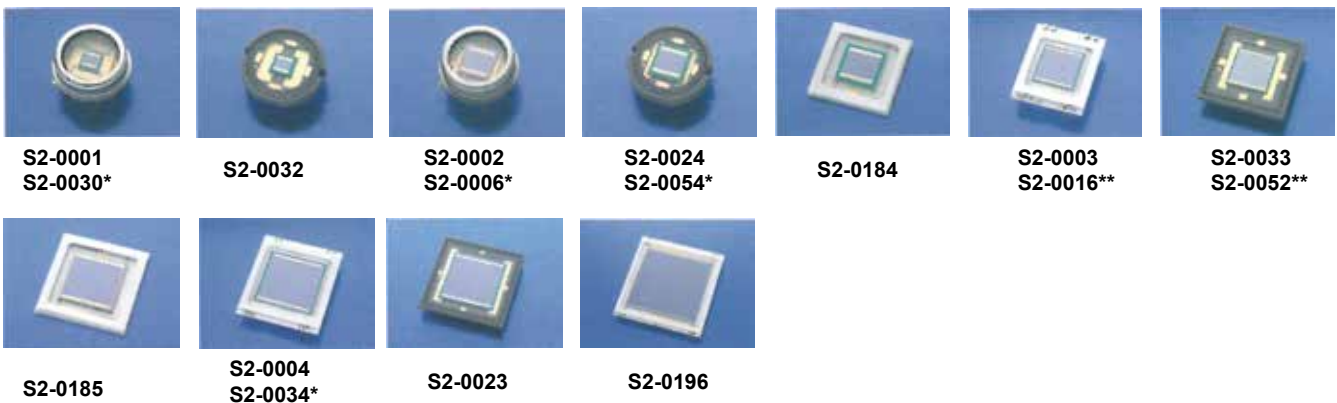
1DSPC-PSD



One-Dimensional PSD with Attached Signal Processing Circuit SPC-PSD

Position non-linearity $\pm 0.1\%$							
Part.No.	Type	Active area (mm ²)	Transimpedance	Output noise	Bandwidth	Output voltage	Package
S1-0257	1L2.5_SU74_SPC01	2.5x0.6	1000x10 ⁵ V/A	3mVp-p	400 kHz	$\pm 12V$	16-pin ceramic substrate
S1-0271	1L2.5_SU74_SPC02	2.5x0.6	1000x10 ⁵ V/A	3mVp-p	400 kHz	$\pm 12V$	16-pin ceramic substrate
S1-0231	1L5_SU74_SPC01	5x1	1000x10 ⁵ V/A	3mVp-p	400 kHz	$\pm 12V$	16-pin ceramic substrate
S1-0272	1L5_SU74_SPC02	5x1	1000x10 ⁵ V/A	3mVp-p	400 kHz	$\pm 12V$	16-pin ceramic substrate
S1-0222	1L10_SU74_SPC01	10x2	1000x10 ⁵ V/A	3mVp-p	400 kHz	$\pm 12V$	16-pin ceramic substrate
S1-0273	1L10_SU74_SPC02	10x2	1000x10 ⁵ V/A	3mVp-p	400 kHz	$\pm 12V$	16-pin ceramic substrate

2D-PSD



Two-Dimensional PSD

Position non-linearity $\pm 0.3\%$			Detector resistance 10 kohm				
Part.No.	Type	Active area (mm ²)	Leakage current (nA)	Noise Current pA/ $\sqrt{\text{Hz}}$	Capacitance (pF)	Rise time (10-90%)(μs)	Package
S2-0001	2L2_MP1	2x2	50	1.3	7	0.03	TO-8
S2-0032	2L2_CP4	2x2	50	1.3	7	0.03	4-pin ceramic
S2-0002	2L4_MP1	4x4	50	1.3	20	0.08	TO-8
S2-0024	2L4_CP5	4x4	50	1.3	20	0.08	4-pin ceramic
S2-0184	2L4_SU71	4x4	50	1.3	20	0.08	SMD
S2-0003	2L10_SU7	10x10	100	1.3	90	0.4	Substrate
S2-0033	2L10_C96	10x10	100	1.3	90	0.4	4-pin ceramic
S2-0185	2L10_SU72	10x10	100	1.3	90	0.4	SMD
S2-0004	2L20_SU9	20x20	200	1.5	360	1.6	Substrate
S2-0023	2L20_CP7	20x20	200	1.5	360	1.6	4-pin ceramic
S2-0196	2L45_SU24	45x45	400	1.5	1600	7	Substrate

Two-Dimensional PSD with Enhanced UV Respons

Position non-linearity $\pm 0.1\%$			Detector resistance 10 kohm				
Part.No.	Type	Active area (mm ²)	Leakage current (nA)	Noise Current pA/ $\sqrt{\text{Hz}}$	Capacitance (pF)	Rise time (10-90%)(μs)	Package
S2-0030*	2L2UV_MP1	2x2	50	1.3	7	0.03	TO-8
S2-0006*	2L4UV_MP1	4x4	50	1.3	20	0.08	TO-8
S2-0016**	2L10UV_SU7	10x10	100	1.3	90	0.4	Substrate
S2-0034**	2L20UV_SU9	20x20	200	1.5	360	1.6	Substrate

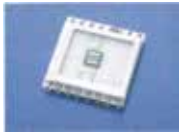
* With sapphire window, quartz optional on request

**With quartz window

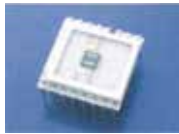


Position Sensing Detector

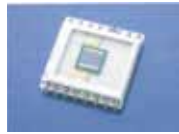
2D-SPC-PSD



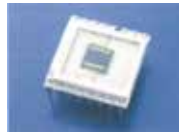
S2-0178



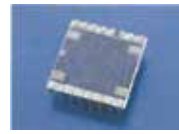
S2-0244



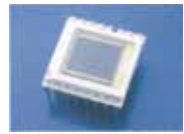
S2-0209



S2-0245



S2-0171



S2-0246

Two-Dimensional PSD with Attached Signal Processing Circuit SPC-PSD

Position non-linearity $\pm 0.3\%$							
Part.No.	Type	Active area (mm ²)	Transimpedance	Output noise	Bandwidth	Output voltage	Package
S2-0178	2L2_SU75_SPC01	2x2	1000x10 ⁵ V/A	3mVp-p	400 kHz	$\pm 12V$	16-pin ceramic substrate
S2-0244	2L2_SU75_SPC02	2x2	1000x10 ⁵ V/A	3mVp-p	400 kHz	$\pm 12V$	16-pin ceramic substrate
S2-0209	2L4_SU66_SPC01	4x4	1000x10 ⁵ V/A	3mVp-p	400 kHz	$\pm 12V$	16-pin ceramic substrate
S2-0245	2L4_SU66_SPC02	4x4	1000x10 ⁵ V/A	3mVp-p	400 kHz	$\pm 12V$	16-pin ceramic substrate
S2-0171	2L10_SU65_SPC01	10x10	1000x10 ⁵ V/A	3mVp-p	400 kHz	$\pm 12V$	16-pin ceramic substrate
S2-0246	2L10_SU65_SPC02	10x10	1000x10 ⁵ V/A	3mVp-p	400 kHz	$\pm 12V$	16-pin ceramic substrate

PSD-Array

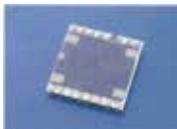


SA-0039

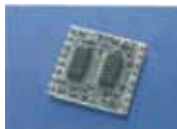
PSD-Array

Position non-linearity			Detector resistance 10 kohm							
Part.No.	Type	Active area (mm ²)	Leakage current (nA)	Noise Current pA/ $\sqrt{\text{Hz}}$	Capacitance (pF)	Rise time (10-90%)(μs)	Package	Number of segments	Gap between segments	Cross talk
SA-0039	1LA16-2.5_SU89	2.5x0.39	2	0.8	4	70	34-pin PID	16	10 μm	0.50%

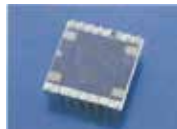
SPC



SE-0010



SE-0011



SE-0010

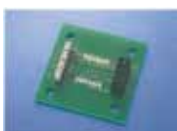


SE-0011

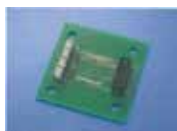
Signal Processing Circuit

Part.No.	Type	Transimpedance	Output noise	Bandwidth	Output voltage	Package
SE-0010	SPC01	100 000 V/A	3mVp-p	400kHz	± 12	16-pin SMD J-LED
SE-0011	SPC02	100 000 V/A	3mVp-p	400kHz	± 12	16-pin DIP

Evaluation Board



SE-0012



SE-0013

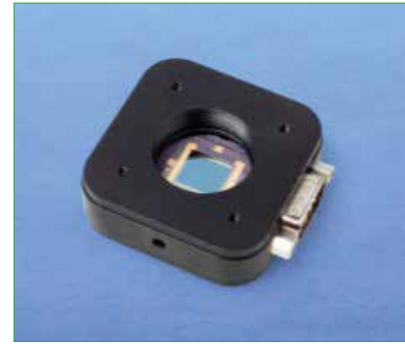
Signal Processing Circuit

Part.No.	Type	Size (mm)
SE-0012	SPC01 Evaluation board	70x70
SE-0013	SPC02 Evaluation board	70x70

PSD Holder MH01

The SiTek PSD Holder MH01 is a high linearity PSD assembled in mechanical holder. The mechanical holder has a size of only 52 x 52 mm² and the PSD is easily accessed via a DSUB9 connector. It is designed to fit Φ 1" filters as well as standard optomechanical components, such as posts and lens tubes. To minimize reflections it has a black anodized surface.

The holder is available with SiTek's PSDs ranging from 2,5 - 20mm (1D) and 2 x 2 – 20 x 20 mm²(2D). SiTek's UV-enhanced PSDs and PSDs with stray light elimination (NT) can be delivered mounted in the PSD mechanical holder upon request.



Picture shows PSD Holder MH01 with a 2L10 PSD (S2-0359)

PSD Holder with 1-dimensional PSDs

General data						
Position non-linearity +/-0,1%						
Detector resistance 50 kohm						
Part Number	Description	Active area (mm ²)	Leakage current (nA)	Noise Current pA/ $\sqrt{\text{Hz}}$	Capacitance(pF)	Rise time (10-90%)(μs)
S1-0320	1L2,5_MH01	2.5x0.6	2	0.4	1.6	0.03
S1-0321	1L5_MH01	5x1	4	0.4	5	0.05
S1-0322	1L10_MH01	10x2	8	0.4	15	0.2
S1-0323	1L20_MH01	20x3	60	0.5	45	0.5

PSD Holder with 2-dimensional PSDs

General data						
Position non-linearity +/-0,3%						
Detector resistance 10 kohm						
Part Number	Description	Active area (mm ²)	Leakage current (nA)	Noise Current pA/ $\sqrt{\text{Hz}}$	Capacitance(pF)	Rise time (10-90%)(μs)
S1-0357	2L2_MH01	2x2	50	1.3	7	0.03
S1-0358	2L4_MH01	4x4	50	1.3	20	0.08
S1-0359	2L10_MH01	10x10	100	1.3	90	0.4
S1-0360	2L20_MH01	20x20*	200	1.5	360	1.6

*Active area is limited by Φ 23 mm aperture

Pin no.	Output
1	X1 (only 2D-PSD)
2	X2 (only 2D-PSD)
3	Y1
4	Y2
5	N.C.
6	N.C.
7	N.C.
8	Bias (only 1D-PSD)
9	N.C.

The PSD connections are accessed via a DSUB9 connector and the holder can be connected to SiTek's Signal Processing System SEEPOS either with the supplied cable or, with minor modification, by direct plug-in.



PSD Signal Processing System

Part number:SE-0018_SEEPOS

Description:SEEPOS

The SiTek SEEPOS is a versatile PSD signal processing tool optimized for development of PSD systems. High speed PSD electronics combined with digital signal processing and high speed USB data transfer gives a powerful measurement system. With its large dynamic range it can handle light powers from nW to mW from DC light sources as well as modulated light sources.

All parameters, such as PSD bias voltage, amplifier gain, the use of analog and digital filters etc., are easily controlled from the included software and light spot position is continuously displayed both in XY and X-t, Y-t graphs.

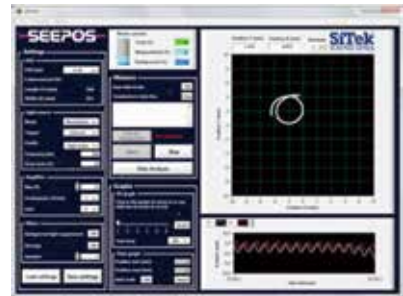
Optimized plot algorithms ensure that all data is visually seen on the screen even in full speed measurements. Included tools for data analysis and visualization simplify rapid scan through large data sets in order to find specific parts of interest.

Key Features

- * Extremely versatile – all important parameters are easily adjusted
- * Highest performance – 16 bit A/D conversion at 1 MHz and full speed USB data transfer
- * User friendly – intuitive interface based on LabView
- * Suitable for all users – Easy set-up and advanced analyzing functions included

Example of Applications

- * Development measurements
- * Beam alignment
- * Optical system quality control
- * Monitoring of vibration deflection and motion
- * Target rotation and displacement
- * Fast steering mirror measurement



Technical Specification Parameters

Analog Part	
Input photo current range	50nA-5mA
Pre amplifier gain	1000V/A,50000V/A
PSD bias voltage	0-30V(continuously variable)
HP-filter cutoff frequency	150Hz(on/off)
Digital Part	
A/D conversion	16bit
Sampling frequency	1MHz(parallel)
Light source trigger frequency (TTL)	DC-250kHz
Computer interface	USB2.0
Other	
External light source trigger frequency(TTL)	DC-100kHz
PSD interface	DSUB9
Dimensions W x H x L	124,4mm x 36,2mm x 148mm

Setup



Complete SEEPOS is delivered with: Hardware,Software,USB cable,Power supply and User manual.

Connection



Frontside



Backside

Position Sensing Modules

Features

- * Fully Packaged Position Sensing Detectors
- * Silicon Linear : 400-1100 nm
- Silicon Duolateral : 400-1100 nm
- Silicon Quadrant : 400-1100 nm
- Germanium Tetra-Lateral : 800-1800 nm
- * Removable Filter Holder Adapter
- * Standard Mounting Holes
- * Plug and Play Compatibility with all ON-TRAK Position Sensing Amplifiers



1. OT-301 Versatile Position Sensing Amplifier
2. OT-302 Display Module
3. PSM2-10 Position Sensing Module
4. Laptop Computer with Beam Trak software

PSM Specifications

Model	Active Area(mm)	Detector Type	Wavelength Range	Package Type	Typ. Resolution	Typ. Linearity
PSM 1-2.5	2.5 x 0.6	Linear Silicon	400 - 1100nm	Compact	62.5nm	0.10%
PSM 1-5	5.0 x 1.0	Linear Silicon	400 - 1100nm	Compact	125nm	0.10%
PSM 1-10	10.0 x 2.0	Linear Silicon	400 - 1100nm	Standard	250nm	0.10%
PSM 1-20	20.0 x 3.0	Linear Silicon	400 - 1100nm	Standard	500nm	0.10%
PSM 1-30	30.0 x 4.0	Linear Silicon	400 - 1100nm	Standard	750nm	0.10%
PSM 2-2	2.0 x 2.0	Duolateral Silicon	400 - 1100nm	Compact	50nm	0.30%
PSM 2-3I	3.0 x 3.0	Quadrant InGaAs	900 - 1700nm	Compact	100nm	N/A*
PSM 2-4	4.0 x 4.0	Duolateral Silicon	400 - 1100nm	Compact	100nm	0.30%
PSM 2-4Q	4.0 x 4.0	Quadrant Silicon	400 - 1100nm	Compact	100nm	N/A*
PSM 2-5G	5.0 x 5.0	Pincushion Tetralateral Germanium	800 - 1800nm	Compact	5µm	--
PSM 2-10	10.0 x 10.0	Duolateral Silicon	400 - 1100nm	Standard	250nm	0.30%
PSM 2-10Q	9.0 x 9.0	Quadrant Silicon	400 - 1100nm	Standard	100nm	N/A*
PSM 2-10G	10.0 x 10.0	Pincushion Tetralateral Germanium	800 - 1800nm	Standard	5µm	--
PSM 2-20	20.0 x 20.0	Duolateral Silicon	400 - 1100nm	Standard	500nm	0.30%
PSM 2-45	45.0 x 45.0	Duolateral Silicon	400 - 1100nm	Standard	1.25µm	0.30%

* For nulling applications

PSM Accessories

Model	Description
F12.5-632.2	12.5mm optical filter. 632.8nm, +2.0/-0nm FWHM 10±2nm. 50%transmittance
F25-632.8	25mm optical filter. 632.8nm, ±2.0/-0nm. FWHM 10±2nm. 50%transmittance
F12.5-635	12.5mm optical filter. 635nm, +5.0/-0nm FWHM 10±2nm. 50%transmittance
F25-635	25mm optical filter. 635nm, +5.0/-0nm. FWHM 10±2nm. 50%transmittance
F12.5-670	12.5mm optical filter. 670nm, +3.0/-0nm FWHM 10±2nm. 50%transmittance
F25-670	25mm optical filter. 670nm, +3.0/-0nm. FWHM 10±2nm.50%transmittance
F12.5-HA	12.5mm Blank Filter Holder Adapter
F25-HA	25mm Blank Filter Holder Adapter
CA-DB9MM-5	5 foot molded cable. DB9 connector
CA-SC10FR-3	3 foot ribbon cable. 10 pin socket connector.
PS-3	Post and Stand



Choose from a wide range of PSM accessories

OT-302D Display Module

Features

- * LCD Display of Absolute Position
- * LCD Backlight and Brightness Control
- * X,Y Position and Sum Display
- * Metric(mm)or English(in)
- * RS232 Interface
- * Push Button Zero Offset
- * Computer Controlled or Stand Alone
- * Front Panel Push Button Control
- * High Resolution 0.1 Micron (0.0001")
- * Display Update Control 0.1 to 25.5 Second Update Speed
- * Calibration Features for all Size Detectors
- * Fast/Slow Averaging



Specifications

Input Voltage	Range X,Y and Sum : 0 to ±10V
Display Resolution	0.0001 inches (0.0001mm)
Update Speed	0.1 sec to 25.5 sec
Power Supply	12VDC 500mA wall adapter
Size	2.5 x 5.5 x 6.5 inches (H x W x D)
RS-232	9600 baud rate, 8 bits, 1 stop bit, no parity
Weight	1 lb. 10 oz.
Display Resolution	0.0001 inch (0.0001 mm)

OT-301 Versatile Position Sensing Amplifier

Features

- * X,Y Analog Position Output Voltages
- * Sum Output
- * Wide Dynamic Range : 0.1µA to 1.5mA
- * DC to 15kHz
- * Compatible With All Position Sensing Detectors
- * Zero Offset / Nulling
- * Calibration Adjust
- * Automatic Detector Bias
- * Position Independent of Beam Intensity



Specifications

Transimpedance Gain (V/A)	4x10 ³ to 4x10 ⁶
Input Current Range	0.1µ to 1.5mA
Output Voltage	Position X,Y : ±10V Sum : 0-6V
Zero Offset(Offset Null)	±1V Each Axis
Calibration Adjust	±10% of reading
Detector Bias	0V±5V (depending on detector)
Linearity	±0.1%
Frequency Response	DC to 15kHz (range dependent)

Gain-Bandwidth	G1 4x10 ³ V/A	2.50x10 ⁻⁴ A/V	15kHz
	G2 1.6x10 ⁴ V/A	6.25x10 ⁻⁵ A/V	15kHz
	G3 6.4x10 ⁴ V/A	1.56x10 ⁻⁵ A/V	5kHz
	G4 2.56x10 ⁵ V/A	3.90x10 ⁻⁶ A/V	1.25kHz
	G5 1.024x10 ⁶ V/A	9.77x10 ⁻⁷ A/V	310Hz
	G6 4x10 ⁶ V/A	2.50x10 ⁻⁷ A/V	80Hz
Output Connectors	BNC		
Input Connector	9 PIN D Sub (DB9)		
Power Requirement	±12V DC @ 300mA (AC Adapter)		
Dimensions	1.5 x 5.5 x 6.0 inches (HxWxD)		

OT-2020 Rotating Laser Target System

Advantage

- * Ultra Precise
- * Real-Time Feedback
- * Faster Measurement
- * Greater Range
- * Simultaneous Measurement
- * Data Analysis

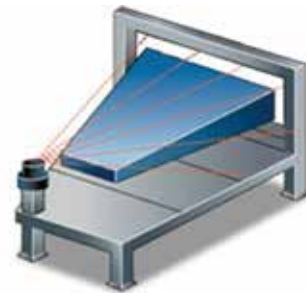


1. Carrying Case
2. Remote Data Terminal(option)
3. Remote Sensor
4. Central Processing Unit
5. Bracket Kit(option)

Applications

Flatness, Squareness, Straightness.

- * Machine Tool Alignment
- * Steel Mill Alignment
- * Process Mill Alignment
- * Horizontal Flatness Alignment
- * Turbine Pad Leveling
- * Surface Leveling
- * Roller Alignment
- * Aircraft Assembly
- * Fuselage Alignment
- * Storage Bin Alignment
- * Seat Track Alignment
- * Floor Beam Alignment
- * Body Join Alignment



Specifications

OT-2020 CPU Central Processing Unit

Resolution	0.001 inches
Power	Rechargeable NiCad batteries 500mA/12V DC wall charger
Battery Life	4 to 6 hours, depending on display brightness setting
Display	LED 4 digit, programmable brightness of 8 levels. 0.8 inches high
Communication	RS-232 ASCII format
Operating Temp.	25° to 125° F
Storage Temp.	-10° to 149° F
Weight	30 oz.
Dimensions	4 x 6 x 1.75 inches (H x W x D)
Mounting	Six 8-32 tapped holes on back of CPU housing

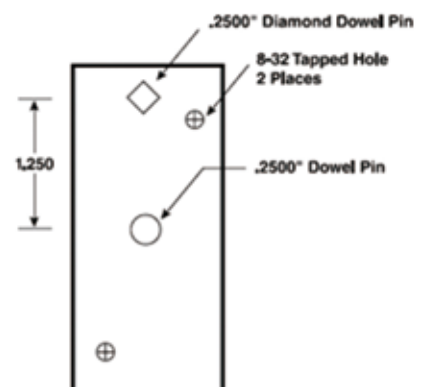
OT-2020 RDT Remote Data Terminal

Display	4 x 20 Supertwist LCD backlight
Communication	RS-232
Power	6AA Alkaline
Battery Life	45 hours
Operating Temp.	25° to 125° F
Storage Temp.	-10° to 149° F
Weight	20 oz.
Dimensions	7.7 x 4.2 x 1.6 inches (H x W x D)

OT-2020 RS1 1" Remote Sensor

Repeatability	0.001 inches
Capture Height	1.0 inches
Accuracy	0.001 inches
Linearity	0.10%
Operating Temp.	25° to 125° F
Storage Temp.	-10° to 149° F
Weight	9 oz
Dimensions	2.75 x 1 x 1 inches (H x W x D)
Mounting	2 locating dowel pins. Three 8-32 tapped holes on back of RS1 housing

RS1 Mounting Pattern



OT-5000 RLT Rotating Laser Target Systems

Advantage

- * Ultra Precise
- * Real-Time Feedback
- * Faster Measurement
- * Greater Range
- * Simultaneous Measurement
- * Data Analysis

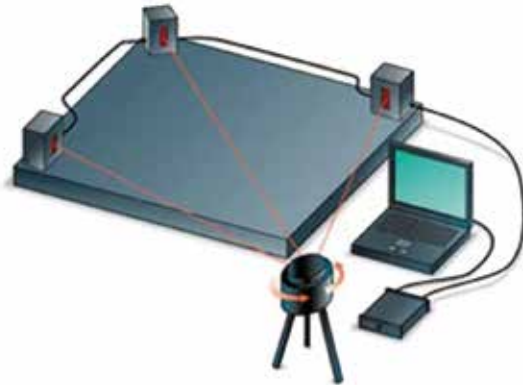


1. Carrying Case 3. Rotating Laser Target
2. Applications Software 4. Digital Interface Module

Applications

Flatness, Squareness, Straightness

- * Machine Tool Alignment
- * Steel Mill Alignment
- * Process Mill Alignment
- * Horizontal Flatness Alignment
- * Turbine Pad Leveling
- * Surface Leveling
- * Roller Alignment
- * Aircraft Assembly
- * Fuselage Alignment
- * Storage Bin Alignment
- * Seat Track Alignment
- * Floor Beam Alignment
- * Body Join Alignment

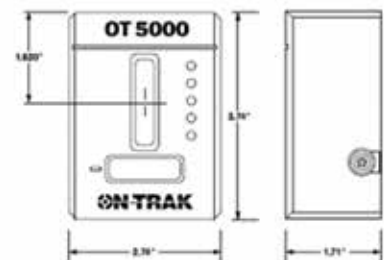


The OT-5000 RLT measures flatness at distances up to 100 feet.

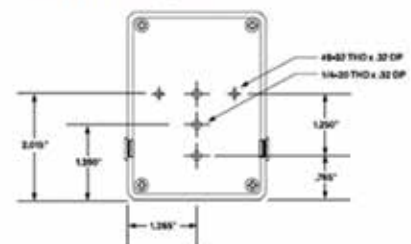
Specifications

Resolution	0.001 inches
Power	500mA/12V DC wall charger
Power Range	0.1 mW to 5 mW
Rotational Speed	0 - 1000 RPM
Distance	0 - 100 feet
Communication	RS-485 Multidrop (RS-485 to RS-232 converter in OT-5000 DIM)
# Of Targets In Loop	Up To Twenty OT-5000 RLT targets Per Each OT-5000 DIM
Display	LED 4 digit
Communication	RS-232 ASCII format
Operating Temp.	25° to 125° F
Storage Temp.	-10° to 149° F

OT-5000 RLT Dimensions



OT-5000 RLT Mounting Pattern



OT-4040 Portable Laser Alignment System

Advantage

- * Cost Effective
- * Ultra Precise
- * Real-Time Feedback
- * Faster Measurement
- * Maximizes Range
- * Simultaneous Measurement
- * Data Analysis



1. Carrying Case
2. Transparent Target
3. Reference Target
4. Optional Reference Target
5. Optional Reference Target
6. Laser
7. Central Processing Unit
8. Remote Data Terminal
9. Reflector Plate
10. Calibration Wedge

Specifications

OT-4040 LL Ultralight Laser

Power Output	Class IIA (<1 mW visible red)
Wavelength	635 nm
Beam Diameter	8 to 12 mm
Beam Profile	Circular gaussian, TEM ₀₀
Modulation Frequency	10 Hz
Operating Distance	0 to 300 feet (100 m)
Centering	±0.002 inches (0.05 mm)
Controls	On /off switch
NiMH Battery Lifetime	24 hours continuous operation
Power Requirement	12V/1A DC wall charger
Weight	8 lbs. (3.64 kg.)
Overall Length	14.5 inches (368.3 mm)
Enclosure	NAS standard 2.2498 inches (57.15 mm) diameter

OT-4040 CPU Central Processing Unit

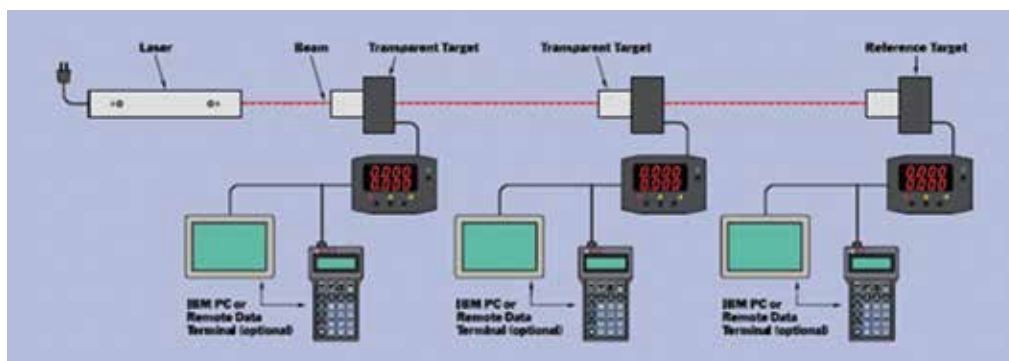
Resolution	0.001 inches
Power	Rechargeable NiMH batteries DC wall charger
Battery Life	10 - 12 hours, depends on brightness
Display	LED ± 4 digit, programmable
Communications	RS-232 ASCII format
Weight	32 oz.
Dimensions	6 x 5 x 1.75 inches (H x W x D)

OT-4040 TTS4 Transparent Target

Position Sensing Area	25 mm diameter
Resolution	0.001 inches (0.01 mm)
Centering	± 0.002 inches (0.05 mm) to NAS mount
Weight	2.75 lbs. (1.25 kg.)
Size	NAS mount: 2.2498 x 3.0 inches (57.15 x 76 mm) Housing: 3.5 x 3.5 x 3.1 inches (89 x 89 x 78 mm)
Laser Acquisition Indicator	Red LED flashes simultaneously Indicator with laser pulse

OT-4040 TS4 Reference Target

Position Sensing Area	25 mm diameter
Resolution	0.001 inches (0.01 mm)
Centering	± 0.002 inches (0.05 mm) to NAS mount
Weight	2 lbs. (0.9 kg.)
Size	NAS mount: 2.2498 x 2.75 inches (57.15 x 76 mm) Housing: 3.5 x 3.5 x 1.6 inches (89 x 89 x 40mm)
Laser Acquisition Indicator	Red LED flashes simultaneously Indicator with laser pulse



How Laser Alignment Works

The principle of linear laser alignment is simple. A stationary laser, aimed at a reference target up to 300 feet away, creates a "line in space" that serves as a rock-solid measurement reference. Next, one or more transparent targets are placed directly in the beam path. As the laser light passes through each transparent target, the target is able to determine the X-Y deviation of the laser beam with respect to the center of the tooling sphere. Finally, this positioning information is output, in real-time, to a CPU for control, display and analysis. (An optional Remote Data Terminal or computer can be used for data collection or remote operation.)



OT-7000 Laser Alignment System

Advantage

- * Cost Effective
- * Ultra Precise
- * Real-Time Feedback
- * Faster Measurement
- * Greater Range
- * Simultaneous Measurement
- * Data Analysis



Specifications

OT-7000 LL Ultralign Laser

Power Output	Class IIA (<1 mW visible red)
Wavelength	635 nm
Beam Diameter	8 to 12 mm
Beam Profile	Circular gaussian, TEM ₀₀
Modulation Frequency	500 Hz
Operating Distance	0 to 300 feet (100 m)
Centering	± 0.002 inches (0.05 mm)
Weight	8 lbs. (3.64 kg.)
Overall Length	14.5 inches (368.3 mm)
Enclosure	NAS standard 2.2498 inches(57.15 mm) diameter

- 1.Applications Software
- 2.Reference Target
- 3.Transparent Target
- 4.Calibration Wedge
- 5.Reflector Plate
- 6.Laser
- 7.CPU
- 8.RF Controller Module

OT-7000 CPU Central Processing Unit

Resolution	0.001 inches
Power Output	Rechargeable NiMH batteries DC wall charger
Battery Life	14-16 hours, depends on brightness
Display	LED ±4 digit, programmable
Weight	4 lbs.
Dimensions	6 x 5 x 2.7 inches (152 x 127 x 68 mm)

OT-7000 TTS4 Transparent Target

Position Sensing Area	25 mm diameter
Resolution	0.001 inches (0.01 mm)
Centering	± 0.002 inches (0.05 mm) to NAS mount
Weight	2.75lbs. (1.25kg.)
Size	NAS mount: 2.2498 x 3.0 inches (57.15 x 76 mm) Housing: 3.5 x 3.5 x 1.6 inches (89 x 89 x 40 mm)
Laser Acquisition Indicator	Red LED flashes simultaneously with laser pulse

OT-7000 TS4 Reference Target

Position Sensing Area	25 mm diameter
Resolution	0.001 inches (0.01 mm)
Centering	± 0.002 inches(0.05 mm) to NAS mount
Weight	2 lbs. (0.9 kg.)
Size	NAS mount: 2.2498 x 2.75 inches (57.15 x 76 mm) Housing: 3.5 x 3.5 x 1.6 inches (89 x 89 x 40 mm)
Laser Acquisition Indicator	Red LED flashes simultaneously with laser pulse

Acousto-Optic Material Selection

A variety of different acousto-optic materials are used depending on the laser parameters such as laser wavelength (optical transmission range), polarization, and power density. Table 1 is a summary of the most common materials used for Brimrose's acousto-optic modulators. For the visible region and near infrared region the modulators are commonly made from gallium phosphide (Brimrose pioneered), tellurium dioxide, indium phosphide (Brimrose pioneered), or fused quartz. At the infrared region, germanium is the only commercially available modulator material with a relatively high figure of merit. Lithium niobate, indium phosphide, and gallium phosphide are used for high frequency (GHz) signal processing devices.

Material	Optical Range (micron)	Optical Polarization	MAX CW Laser Power (watt/mm ²)	Refractive Index	Acoustic Mode	Acoustic Velocity (km/sec)	Figure Of Merit x10 ⁻¹⁵ m ² /w	Modulator Series
Chalcogenide Glass	1.0 - 2.2	Random	0.5	2.7	L	2.52	164	AMM-0-0
Flint Glass SF6	0.45 - 2.0	Random	0.7	1.8	L	3.51	8	FGM-0-0
Fused Quartz	0.2 - 4.5	Linear	> 100	1.46	L	5.96	1.56	FQM-0-0
Gallium Phosphide	0.59 - 10.0	Linear	5	3.3	L	6.3	44	GPM-0-0
Germanium	2.0 - 12.0	Linear	2.5	4.0	L	5.5	180	GEM-0-0
Indium Phosphide	1.0 - 1.6	Linear	5	3.3	L	5.1	80	IPM-0-0
Lithium Niobate	0.6 - 4.5	Linear	0.5	2.2	L	6.6	7	LNM-0-0
Lithium Niobate	0.6 - 4.5	Linear	0.5	2.2	S	3.6	15	LNM-0-0
Tellurium Oxide	0.4 - 5.0	Random	5	2.25	L	0.62	34	TEM-0-0
Tellurium Oxide	0.4 - 5.0	Circular	5	2.25	S	5.5	1000	TEM-0-0

Table 1. Acousto-optic material characteristics.

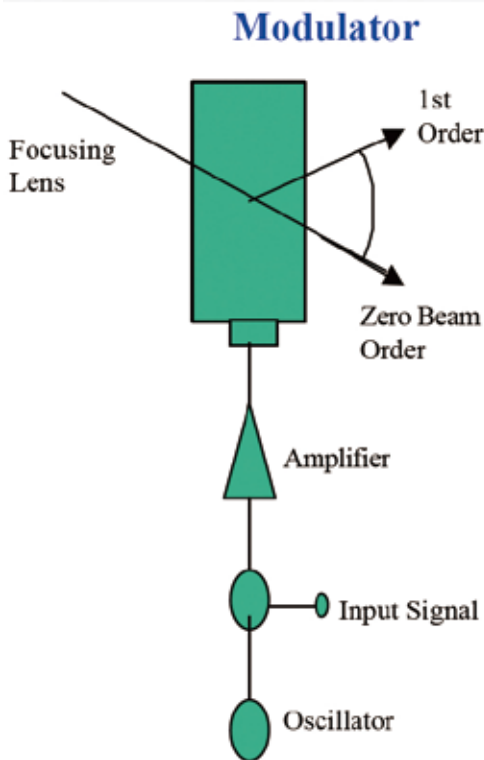


Figure 1

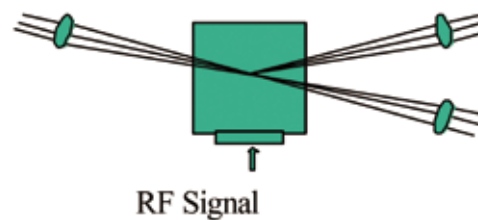
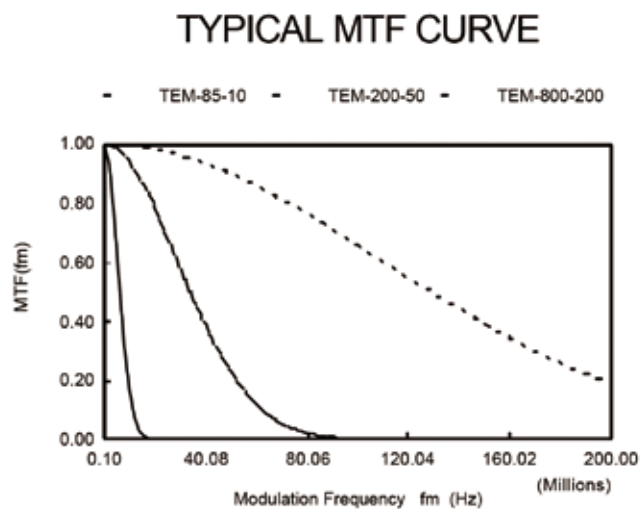


Figure 2. Focusing for A-O Modulator



Free Space Acousto-Optic Modulators



The Brimrose free space Acousto-Optic Modulator (AOM) with RF driver is used to vary and control laser beam intensity. It is electronically programmable using a microprocessor connected to the Brimrose RF driver unit. The RF driver features all the necessary components to drive the modulator with analog or digital input control.

Our free space AO products are housed in environmentally stable packages. They offer superior resistance to humidity and temperature, and are suitable for laboratory as well as various OEM applications and instrumentations.

Key Features

- * Compact Integrated Design
- * Wide Spectral Wavelength Range
- * Low RF Power Consumption
- * Fast Switching Speed
- * High Bandwidth
- * High Diffraction Efficiency
- * Good Temperature Stability
- * Custom Configurations – “Our Specialty”

Applications

- * TTL/Digital Amplitude Modulation
- * Analog Amplitude Modulation
- * Photo Processing
- * Laser Displays
- * Micro Machining
- * Pulse Picking
- * OEM Designs



Model #	Spectral Range (nm)	Rise Time (ns)	Active Aperture (mm)	Modulation Bandwidth (MHz)	Diffraction Efficiency* (%)
TEM-85-2	380-1600	280	2.0	2	80
TEM-85-10	380-1600	55	1.0	10	80
TEM-110-25	380-1600	22	0.5	25	80
TEM-200-50	380-1600	10	0.3	50	70
TEM-400-100	380-1600	5.5	0.075	100	50
TEM-800-200	380-1600	3	0.05	200	35
AMM-27-2	1000-2500	300	1	1.8	>80
AMM-80-4	1000-2500	160	1	4	>80
AMM-100-8	1000-2500	68	0.3	8	>80
FQM-80-2	200-1300	195	1.6	2.8	70
FQM-80-20	200-1300	30	1	18	70
FQM-200-40	200-1300	14	0.3	40	70
GEM-40-4	2000-11,000	125	1.5	5	70
GPM-200-50	600-1600	11	0.3	50	>75
GPM-400-100	600-1600	5.1	0.1	108	>65
GPM-800-200	600-1600	2.6	0.05	217	>40
GPM-1600-400	600-1600	1.4	0.025	400	>25
IPM-200-26	1000-1600	21	0.3	26	60
IPM-400-100	1000-1600	5	0.075	100	50

Fiber-Coupled Acousto-Optic Modulators



Key Features

- * Compact Size
- * Rugged Design
- * Low Insertion Loss
- * Fast Switching Speed
- * Low RF Drive Power
- * Stable Performance
- * Custom Configurations Available

Applications

- * TTL/Digital Amplitude Modulation
- * Analog Amplitude Modulation
- * Fast Attenuator
- * Gain Tilt Control
- * EDFA Power Control
- * Loop-back Switch
- * Telecommunications
- * Fiber Sensing
- * Pulse Picking, Q-Switching
- * Spectroscopy
- * Fiber Lasers
- * OEM Designs

Fiber-coupled Acousto-Optic Modulators

The Brimrose all fiber optic, electronically controllable, optical modulators utilize a unique, proprietary AO device fabrication and fiber coupling technology to ensure that our products are rugged, compact and of the highest quality.

Our fiber-coupled AO products are housed in environmentally stable packages, which offer superior resistance to humidity and temperature, and are suitable for laboratory as well as various OEM applications and instrumentations.

Typical Specifications

ON/OFF Extinction (dB)	> 50
Back Reflection (dB)	< -50
Insertion Loss (dB)	< 2.5
Wavelengths (nm)	380-2100
Low Electric Power Consumption (dBm)	< 23
Operating Wavelength Range (nm)	± 25

Model #	Wavelength (nm)	Center Frequency (MHz)	Rise Time (ns)	Modulation Bandwidth (MHz)	Fiber Type
TEM-110-10-55-2FP	380-1600	110	55	10	SM or SMPM
TEM-200-25-20-2FP	380-1600	200	20	25	
TEM-250-50-10-2FP	380-1600	250	10	50	
TEM-500-100-5-2FP	380-1600	500	5	100	
IPM-200-25-20-2FP	1000-2100	200	20	25	
IPM-500-100-5-2FP	1000-2100	500	5	100	
AMM-55-8-70-2FP	1000-2500	55	70	8	
AMM-100-20-25-2FP	1000-2500	100	25	20	

Detectors

Isolators

Position Sensing Detectors

Acousto-Optic Modulators

Pulse and Delay Generators

Polarimeters



Fixed Frequency Driver

Brimrose offers a large variety of RF drivers compatible with our AO Modulators. A typical AO RF driver consists of an RF oscillator, amplitude modulation scheme and RF amplifier. Changing the RF power level will vary the intensity of the transmitted light.



Fixed Frequency Driver Specifications

Driver Model #	FFA-XX-B1-FY	FFA-XX-B2-FY
Frequency (MHz)	XX MHz (compatible with the AO Device)	
Frequency Control	Quartz crystal referenced phase locked loop	
Frequency Accuracy (%)	0.015	
Harmonic Content (dBc)	≤ - 20	
Frequency Stability	0.0015% minimum after 15 minute warm-up	
Output Power	Power is optimized for peak efficiency with the supplied AO device.	
Output Protection	Power amplifiers used will tolerate an infinite V.S.W.R. without damage. Rated power is available only when a proper RF load is connected.	
Rise/Fall Time	To match AO Modulator requirements	
Modulation Type	Analog amplitude modulation	TTL compatible
Modulation Rate	To match AO Modulator requirements	
Modulation Input	50Ω ; 0-1 V	330Ω ; 0-5 V
Operating Power	90-240 VAC, 50-60 Hz, 55 Watts max.	
Enclosure	The unit will be packaged in a 190 mm (7.5 inch) wide by 100 mm (4 inch) high by 220 mm (8.75 inch) deep instrument case. The rear panel heat sink increases the depth to 240 mm (9.75 inches) maximum. The size is exclusive of connectors. A detachable AC line cord and RF cable are provided.	
Environmental	Nominal Laboratory Conditions: The maximum temperature is +35° C. The unit is not sealed against moisture or condensing humidity.	

Free Space Acousto-Optic Tunable Filter (AOTF)



Free Space Acousto-Optic Tunable Filters

The Brimrose Acousto-Optic Tunable Filter (AOTF) is a solid state acousto-optic device with no moving parts. It functions as a tunable transmissive filter. It is able to precisely and rapidly adjust the wavelength, and intensity of the diffracted/filtered light by varying the RF power. Brimrose offers both standard and custom AOTFs. AOTFs are used widely in numerous optical systems and applications, especially in industrial or process control near-infrared (NIR) spectroscopy applications.

Key Features

- * All Rugged, Solid State
- * No Moving Parts – Immune to vibrations
- * Use with Multiple Laser Lines Simultaneously
- * Wide Spectral Wavelength Range
- * Fast Switching Speed
- * Low Sensitivity to Input Angle
- * High Optical Throughput
- * Auto Calibration between Each Measurement
- * Custom Configurations Available
- * Ideal for Real-Time NIR

Applications

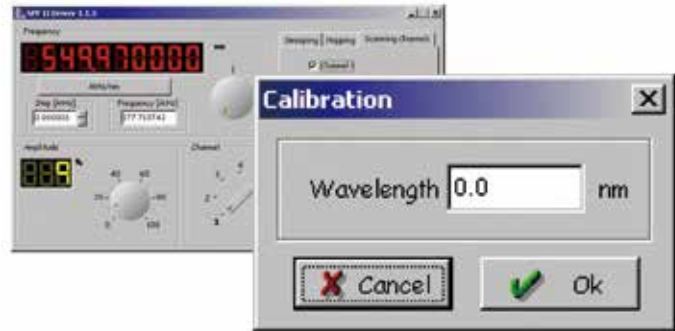
- * Scientific:
 - Spectrophotometry Monochromation
 - Florescence Analysis, Transmission
 - Laser Displays
- * Industrial:
 - Process Control
- * Biomedical:
 - Confocal Microscopy
 - Polarimetric Hyperspectral Imagery (the AOTF is inserted in the imagery system)
- * Other OEM Applications

Model #	Spectral Range (nm)	Drive Freq. (MHz)	Optical Aperture (mm)	Spectral Resolution (nm)			Acceptance Angle (deg.)		DE (%)
				S	H	EH	S	H	
QZAF-.20-.40	200 - 400	90 - 250	2.0 x 10.0	1.2 - 7.0			4.4 - 7.2		20 - 30
TEAF_-.36-.52_	360 - 520	100 - 190	5.0 x 5.0	0.8 - 4.0	0.5 - 2.2		4.18 - 4.36	2.85 - 3.4	70
TEAF_-.40-.65_	400 - 650	220 - 110	Available	1.0 - 5.1	0.5 - 2.5		4.8 - 6.2	3.4 - 4.4	70 - 90
TEAF_-.45-.70_	450 - 700	180 - 100	Standard	1.7 - 6.2	0.8 - 3.2		5.2 - 6.5	3.6 - 5.0	70 - 90
TEAF_-.55-1.0_	550 - 1000	155 - 70	Optical	1.5 - 8.3	0.9 - 5.0		4.3 - 5.9	3.2 - 4.5	70 - 90
TEAF_-.40-1.0-2CH*	400 - 1000	220 - 70	Apertures	1.2 - 8.3	0.7 - 5.0		3.8 - 5.9	2.8 - 4.6	50 - 60
TEAF_-.80-1.6_	800 - 1600	130 - 60	Includes:	S	H	EH	S	H	70 - 90
TEAF_-1.2-2.0_	1200 - 2000	90 - 50	3.0 x 3.0	4 - 10	3 - 8	2 - 6	5.39 - 5.71	4.96 - 7.2	
TEAF_-1.5-3.0_	1500 - 3000	68 - 34	5.0 x 5.0	6 - 16	6 - 12	4 - 9	6.78 - 8.56	5.3 - 7.5	25 - 35
TEAF_-2.4-4.5_	2400 - 4500	40 - 20	7.0 x 7.0	9 - 37	8 - 29	6 - 22	7.4 - 9.26	6.6 - 7.95	30
TEAF_-0.8-1.6-UH	800 - 1600	190 - 90	10.0 X 10.0	25 - 83	18 - 65	14 - 48	8.43 - 11.38	7.3 - 9.72	40
TEAF_-1.2-1.7-UH	1200 - 1700	120 - 80	Other	S	H		S	H	60
TEAF_-1.5-2.4-UH	1500 - 2400	90 - 55	Optical	2 - 6	2.0 - 4.5		9.9 - 15.2	8.65 - 13.3	
TEAF_-2.4-3.2-UH	2400 - 3200	55 - 40	Apertures	5 - 7	3.0 - 5.0		11.9 - 14.68	9.47 - 12.88	50
TEAF_-3.2 - 4.5-UH	3200 - 4500	45 - 30	Are	6 - 14	4.5 - 11.0		13.4 - 16.95	11.9 - 15.2	40
			Available	14 - 25	11.0 - 17.0		16.95 - 19.8	15.2 - 17.29	35
			Upon	24 - 48	17.5 - 37.0		19.8 - 23.44	17.29 - 20.9	30
			Request.						



SPS/SPF Model AO Controller

The SP Model AO Controllers are high performance RF frequency synthesizers incorporated into a self-contained case with AC power supply. A modular cable with a DB9 connector interface allows frequency control via the Personal Computer USB port (Serial RS232 optional). Using simple commands with any terminal (modem) program (such as ProComm) allows the user to set any frequency from the computer keyboard. In addition, included with the unit is a frequency control program that can be used with any IBM PC computer.



Driver Model #	VFI-XX-YY-SPS-A-C3	VFI-XX-YY-SPF-A-C3
Frequency Range	Matching the AOTF requirements.	
Frequency Step Size	4 Hz	10 Hz
Frequency Stability	0.010% absolute (100 PPM); +15°C to +75°C	0.015%; +15°C to +75°C
Frequency Switching Speed	15 ms typ. (from f_{min} to f_{max})	8 ns
Minimum Duration of Each Step	N/A	32 ns for sweeping mode 1 ms for hopping mode (for <300 hops) 15 ms for hopping mode (>300 hops)
Power Output	Optimized for maximum performance of the AOTF device.	
Power Control	N/A	12 bit attenuator with 25 dB range (min.)
Modulation	None (TTL or Analog Optional)	
Enclosure	The unit will be packaged in a 190 mm (7.5 inch) wide by 100 mm (4 inch) high by 220 mm (8.75 inch) deep instrument case. The rear panel heat sink increases the depth to 270 mm (10.5 inches) maximum. The size is exclusive of connectors. A detachable AC line cord and RF cable are provided.	
Environmental	Nominal Laboratory Conditions: The maximum temperature is +35° C. The unit is not sealed against moisture or condensing humidity.	
Output Impedance	50 ohms	
Output Connectors	SMA jack on front panel	

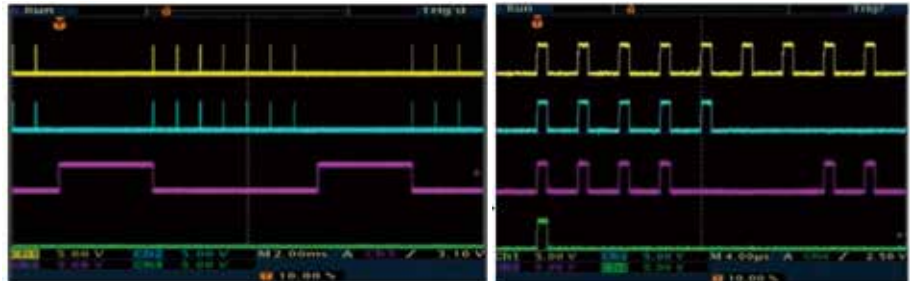
Digital Delay / Pulse Generator – Model 575



The Model 575 Digital Delay / Pulse Generator represents the latest in timing capabilities. With up to 8 outputs configurations as varied as the applications the product serves, the Model 575 is clearly our most versatile instrument. We have combined advanced features such as a Labview/USB interface, complex burst sequences, Divide-by-N, Setting Profiles, Dual Triggers, Clock Divider, Pulse Picking and Negative Delay with core technology in precision timing. Our 250pS Delay & Width resolution, and 50pS internal jitter, allow users great confidence in setting up an experiment or synchronizing multiple events.

Features

- * Illuminated Channel Enable Buttons
- * Selectable Clock Reference
- * Flexible Gating Options
- * Individual Rates
- * Auto-Save
- * Dual Input Panel Connectors
- * Front Panel Optical
- * Front Panel High Voltage
- * Combined Output Types



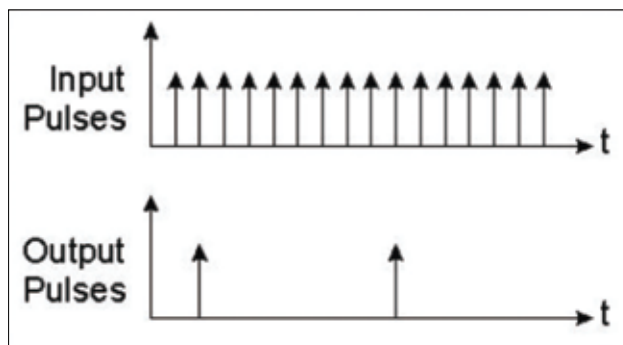
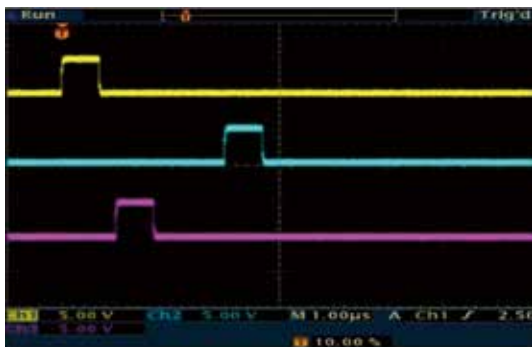
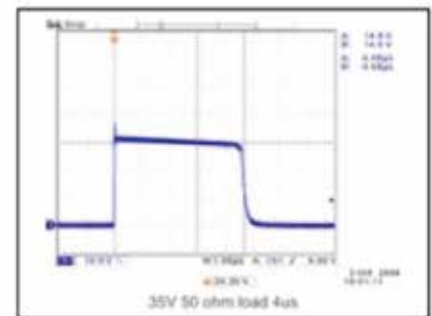
Applications

- * Trigger, Gate, Delay, Pulse or Sync experiments or lasers
- * Sync to an External Clock, Pulse Pick (up to 100MHz)
- * Master / Slave or Multiple Unit Slave; Complex Burst Functions
- * Control Front-End, Q-Switch, Flashlamp, PIV, Laser / Pump Laser Timing

Field Programmability

- * Field Programmability
- * Pulse Picking
- * Customer Output Modes
- * Negative Delay

35v 50 ohm load 4us



Digital Delay / Pulse Generator – Model 575

Specifications

Delays	
Range	0-1000 s
Resolution	250 ps
Timebase	25 ppm
RMS Jitter	50 ps
Pulse Inhibit Delay	120 ns
Output Inhibit Delay	50 ns
System External Trigger Input(s)	
Number	2/1
Rate	DC to 1/(200ns + longest delay); maximum of 5MHz
Threshold	0.2 to 15 VDC
Max Input Voltage	60 V Peak
Resolution	10 mV
Slope	Rising or Falling
Impedance	1 M ohm + 40 pF or 50 ohm
Jitter	800 ps RMS
Insertion Delay	100 ns
Gate Input(s)	
Number	0/1
Threshold	0.2 to 15 VDC
Max Input Voltage	60 V Peak
Resolution	10 mV
Polarity	Active High/Active Low
Function	Pulse Inhibit or Output Inhibit
Channel Behavior	Global w/ Individual Channel Enables
Internal Rate Generator	
Number	0.0002 Hz to 10.000 MHz
Resolution	5 us
Accuracy	Same as timebase
Jitter	50 ps
Setting	1 cycle
Burst Mode	1 to 10,000,000
TTL/Adjustable Outputs	
Number	2, 4 or 8 Channel Outputs
Impedance	50 ohm
Pulse Width Range (TTL)	10 ns - 1000 s
Rise Time (TTL)	3 ns typ
Slew rate (Adjustable)	0.1 V/ns
Overshoot	< 100 mV +10% of pulse amplitude
Levels	TTL 0 to 4 VDC into high impedance *VAR adjustable amplitude, 2.0 to 20.0 VDC with 10 mV res, 20.0 VDC max transition into high impedance

Electrical Inputs	
Number	0 or 2
Rate	DC to 1 (0.2 us + longest delay)
Threshold	0.2 to 15 VDC
Max Input Voltage	60 V Peak
Resolution	10 mV
Impedance	1 M ohm + 40 pF or 50 ohm
Function(s)	Individual Channel Trigger Gate/Follower
Trigger Slope	Rising or Falling
Gate Polarity	Active High or Active Low
Trigger Jitter	< 2 ns
Optical Outputs	
Number	2, 4, 8
Wavelength	820 nm or 1300 nm
Max Signal Rate	5 M Bd
Max Link Distance	1.5 km
Connector Type	ST
Resolution	500 ps
Accuracy	1 ns + 0.0001 x delay
Optical Inputs	
Number	0 or 2
Wavelength	820 nm or 1300 nm
Max Signal Rate	5 Mbd
Max Link Distance	1.5 km
Connector Type	ST
Resolution	500 ps
Accuracy	2 ns + 0.001 x delay
Optical Trigger	2412
Trigger Delay	< 300 ns
Jitter	< 15 ns
Standard Features/Functions	
Communications	USB/RS232
Global Gates/Triggers	2 Global Gate/Trigger Inputs
Channel Gates/Triggers	Optical/Electrical available (5 ns Jitter)
External Clock in	10 MHz - 100 MHz User Selectable in discrete values
External Clock out	10 MHz - 100 Mhz User Selectable in discrete values
Command Set Compatibility	Backwards Compatible

Digital Delay / Pulse Generator – Model 577



The Model 577 Digital Delay / Pulse Generator represents the latest in timing capabilities. Eight outputs, each configurable with its own pattern, its own trigger, its own gate, its own delay and width settings, make the 577 our most versatile instrument. The 250 ps width and delay resolution and 200 ps internal jitter give gating, triggering, delaying, clocking and synchronizing a precision sufficient for nearly every application. Add to this performance: optical or electrical outputs and inputs, pulse picking capabilities, selectable external clocks and USB/RS232 programming.

Features

- * Illuminated Channel Enable Buttons
- * Two Inputs to Use as Triggers and / or Gates
- * Optical and / or Electrical Inputs and Outputs
- * Selectable External Clock Frequency
- * Individual Synchronized Patterns
- * Auto-Save
- * Front Panel Optical
- * High Voltage and 50 Ohm Load Output Modules
- * Electrical and Optical Outputs Simultaneously



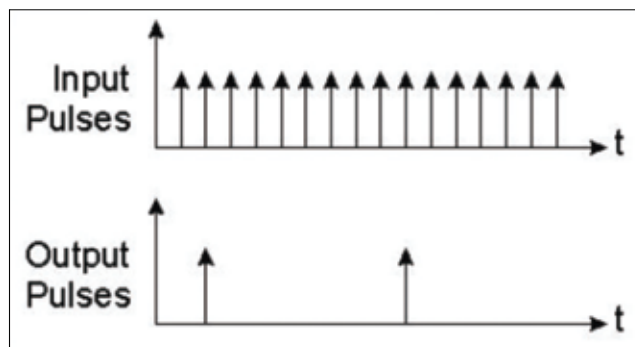
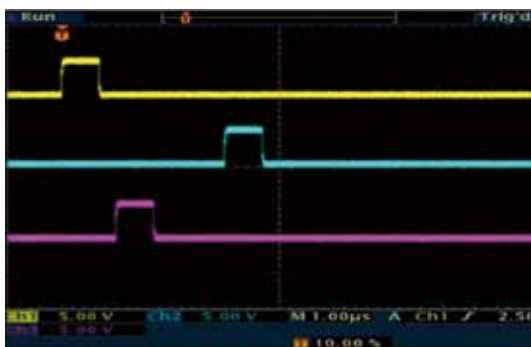
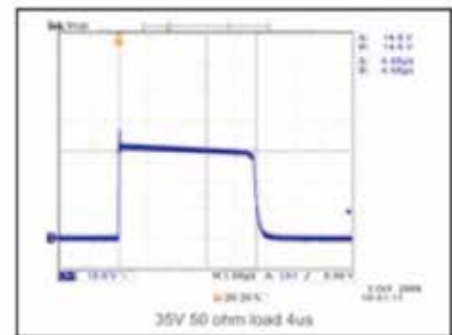
Applications

- * Trigger, Gate, Delay, Pulse or Sync experiments or lasers
- * Sync to an External Clock, Pulse Pick (up to 100MHz)
- * Master / Slave or Multiple Unit Slave; Complex Burst Functions
- * Control Front-End, Q-Switch, Flashlamp, PIV, Laser / Pump Laser Timing

Field Programmability

- * Field Programmability
- * Pulse Picking
- * Negative Delay

35v 50 ohm load 4us



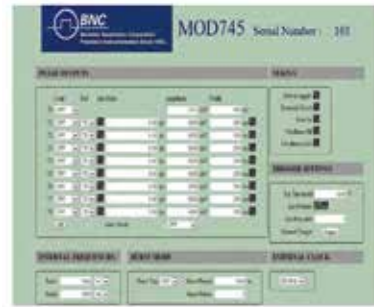
Digital Delay / Pulse Generator – Model 577

Specifications

Delays	
Range	0 -1000 s
Resolution	250 ps
Timebase	25 ppm
RMS Jitter	200 ps
Pulse Inhibit Delay	120 ns
Output Inhibit Delay	50 ns
System External Trigger Input (s)	
Number	2/1
Rate	DC to 1/(200ns + longest delay); maximum of 5MHz
Threshold	0.2 to 15 VDC
Max Input Voltage	60 V Peak
Resolution	10 mV
Slope	Rising or Falling
Impedance	1 M ohm + 40 pF or 50 ohm
Jitter	800 ps RMS
Insertion Delay	100 ns
Gate Input (s)	
Number	0/1
Threshold	0.2 to 15 VDC
Max Input Voltage	60 V Peak
Resolution	10 mV
Polarity	Active High/Active Low
Function	Pulse Inhibit or Output Inhibit
Channel Behavior	Global w/ Individual Channel Enables
Internal Rate Generator	
Number	0.0002 Hz to 10,000 MHz
Resolution	5 us
Accuracy	Same as timebase
Jitter	200 ps
Setting	1 cycle
Burst Mode	1 to 10,000,000
TTL/Adjustable Output (s)	
Number	4 or 8 Channel Outputs
Impedance	50 ohm
Pulse Width Range (TTL)	10 ns - 1000 s
Rise Time (TTL)	3 ns typ
Slew rate (Adjustable)	0.1 V/ns
Overshoot	< 100 mV +10% of pulse amplitude
Levels	TTL 0 to 4 VDC into high impedance *VAR adjustable amplitude, 2.0 to 20.0 VDC with 10 mV res, 20.0 VDC max transition into high impedance

Electrical Inputs	
Number	0 or 2
Rate	DC to 1 (0.2 us + longest delay)
Threshold	0.2 to 15 VDC
Max Input Voltage	60 V Peak
Resolution	10 mV
Impedance	1 M ohm + 40 pF or 50 ohm
Function(s)	Individual Channel Trigger Gate/Follower
Trigger Slope	Rising or Falling
Gate Polarity	Active High or Active Low
Trigger Jitter	< 2 ns
Optical Outputs	
Number	4, 8
Wavelength	820 nm or 1300 nm
Max Signal Rate	5 M Bd
Max Link Distance	1.5 km
Connector Type	ST
Resolution	500 ps
Accuracy	1 ns + 0.0001 x delay
Optical Inputs	
Number	0 or 2
Wavelength	820 nm or 1300 nm
Max Signal Rate	5 Mbd
Max Link Distance	1.5 km
Connector Type	ST
Resolution	500 ps
Accuracy	2 ns + 0.001 x delay
Optical Trigger	2412
Trigger Delay	< 300 ns
Jitter	< 15 ns
Standard Feature / Functions	
Communications	USB/RS232
Global Gates/Triggers	2 Global Gate/Trigger Inputs
Channel Gates/Triggers	Optical/Electrical available in (5 ns Jitter)
External Clock in	10 MHz - 100 MHz User Selectable in MHz Steps
External Clock out	10 MHz - 100 MHz User Selectable To, Ext Clock, & Sub Multiples of each
Command Set	Backwards Compatible

Digital Delay Generator–Model 745 Series



The Model 745 Digital Delay Generator provides four independent delay channels (T1 to T4). The delay resolution is 250fs and external trigger channel jitter is less than 5ps (only in internal mode rms jitter). BNC outputs deliver 5V with a 600ps typical rise time into 50ohms. Amplitude and width are independently adjustable for each output pulse. One input trigger (TRIG IN), or internal timer, or software command is used to trigger all output channels. A T₀ output pulse marks zero delay for each trigger.

The Model 745 also provides four optional delays channels, T5 to T8, at the rear panel. These optional rear panel delay channels have a resolution of 1.25 ns and trigger jitter less than 50ps rms.

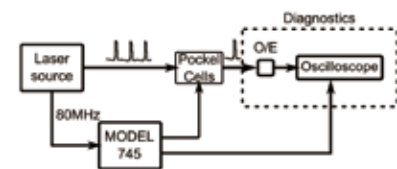
Features

- * 4 or 8 Channel Options
- * 250 Femtosecond Resolution
- * Jitter < 5 picoseconds rms internal mode
- * External Clocking (10 MHz or 80 MHz)
- * Front Panel, Ethernet or Embedded Browser

Applications

- * Component Testing
- * ATE
- * Laser Timing
- * Precision Pulse
- * Instrument Triggering

Applications in Laser Timing



Specifications

Delays	
Channels	4 or 8 independent delay outputs
Range	0 to 20 seconds
Resolution	250 fs
RMS Jitter	25ps rms + delay x 10 ⁻⁷ (external trigger to any output)
	20ps rms + delay x 10 ⁻⁷ (channel to channel)
	< 5ps rms for short delay (channel to channel)
Accuracy	< 250ps + delay x 10 ⁻⁷
Time base	200 MHz, 0.5 ppm stability
Trigger source	
Command	Front panel/ Ethernet
Internal Load	50Ω
Ext. Rep rate	< 1 MHz
	Trigger level, from 0.1 to 5V, Internal load: 50Ω
Trigger Slope	Positive or Negative, Selectable
Min Trigger Delay	< 60 ns
Trigger mode	One Shot, Repetitive
Output T ₀	5 V/50Ω, 100 ns -10 us (rear panel)
Output T1 to T4	
Amplitude	2 to 5 V, step < 0.1 V
Width	100 ns to 10 μs , step: 5 ns, 5 ns combined channel(optional)
Load	50 Ω
Rise Time	< 2 ns (600 ps typical)
Fall Time	< 5 ns
Connector	BNC on front panel
Clock Input	User Specified, settable at factory (between 10 MHz to 80 MHz)
External Time Base (CLK IN)	
Frequency	10 or 80 MHz

General Specifications	
Size	8.5 x 9.7 x 5.4 Inches
Power	50W, 110V-240V
Interface Control	
Front panel, Web page from embedded web server for IE, Firefox, Chrome and Ethernet network	
Options	
Option 8C	Additional Delay Channels (T5, T6, T7, T8)
	Range: 0 to 20 seconds
	Resolution: 1.25 ns
	Jitter < 50 ps rms + delay x 10 ⁻⁷ (external trigger to any output)
	Accuracy: 1 ns + delay x 10 ⁻⁷
	Amplitude: 2 - 5V
Option GOC - Gate input, clock output (10MHz 1V, Square), High Stability Timebase (50ppb)	Width: 10 ns to 10 ms
	Load: 50 Ω
	Rise, Fall time < 5 ns
Connector: BNC on rear panel	
Ordering Information	
745-4C	4 Channels Delay+Width (250fs)
745-4C-GOC	Adds Gate Input, Timebase Stability, Clock Out
745-8C	Adds 4Auxillary Channels
745-8C-GOC	Adds 4 Auxillary Channels, Gate Input, Timebase
P/N 745R1	19" Rack Mount Kit, Single Unit
P/N 745R2	19" Rack Mount Kit, Dual Units



Affordable, Multi Purpose Pulse Generator – Model 505



Model 505 expands the previously established boundaries of antiquated pulse generating equipment by adding 8 independent channels, multiple modes of operation, and 16 different edges into a single instrument. As a pulse generator model 505 provides rate, delay, width, and output adjustability with each channel. As a digital delay generator, model 505 provides fine resolution, timing, and low jitter. By allowing external, internal, and 3rd party software to control the 505 this Digital Delay and Pulse Generator can address many application specific requirements.

The outputs are synchronized to one another with coherence of 5 ns. A channel's timing can be referenced to any other channel or to the zero delay point (To) The edges are adjustable in 10 ns steps. Channels can be selectively gated, enabled / disabled. Each channel possesses separate output level and polarity characteristics along with system level gating capability. Model 505 provides the ability to store custom parameter settings which are able to be recalled for later use.

Instrument Key Features

- * Single Shot – One Pulse with each pushbutton, internal, external, or software trigger.
- * Burst – Each channel will output N number of pulses as specified by the user
- * Duty Cycle – The user can configure each channel to provide N pulses on and M pulses off
- * Gate – Channels can be instructed to respond or ignore trigger signals
- * Recall Capability – The 505 can recall previously stored settings

Specifications

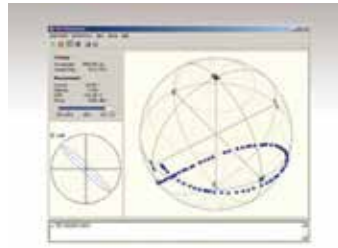
Configuration	2, 4, or 8 channels per instrument
Timing Delays and Widths	
Delay	0 to 1000 seconds with 10 ns resolution
Width	100 ns to 1000 seconds with 10 ns resolution
Accuracy	10 ns + 0.0001 delay
Time Base	50 MHz, 50 ppm crystal oscillator
RMS Jitter	< 2 ns
External Trigger/Gate	
Rate	0 to 2 MHz
Insertion delay	< 250 ns
Threshold	200 mV - 15V
Trigger Slope	Rising or falling edge, selectable
Gate	Active low or active high, selectable
Impedance	1000 ohms
Internal REP Rate Generator	
Rate	0.001 Hz to 2 MHz
Accuracy	5 ns + 0.0001 x period
RMS Jitter	< 500 ps
Outputs	Adjustable to 20 V
Impedance	50 ohm
Adjustable Amplitude	
Slew Rate	> 0.2 V/ns
Amplitude	1 V - 10 V into 50 ohm load 2 V - 20 V into high impedance
Peak Current	150 mA per channel
Average Current	200 mA ave. (total for all channels)
Polarity	Positive (active high) or Negative
Computer Interface (low)	
RS232	4800, 9600, 19200 & 38400
IEEE 4888	Standard
Model Selection	
Model 505-2C	2 Electrical Outputs
Model 505-4C	4 Electrical Outputs
Model 505-8C	8 Electrical Outputs
Accessories	
	19' Rack Mount Extended service/calibration agreements



Polarimeter Systems



PAX7510IR1-T Post, Post Holder, and Base Not Included



Laptop PC Included



PAX5720IR3-T

Features

- * High Dynamic Range of 70 dB
- * Rotating Wave Plate Technology
- * Four Wavelength Ranges

Applications

- * Free Space and In-Fiber Polarimetry
- * Degree of Polarization (DOP) Measurements
- * Extinction Ratio (ER) Measurements
- * Component for a PDL/PMD Measurement System

Fiber-Coupled Polarimeter Specifications

Item #	UPAX5720VIS-T	UPAX5720IR1-T	UPAX5720IR2-T	UPAX5720R3-T
Wavelength Range	400 - 700 nm	700 - 1000 nm	1000 - 1350 nm	1300 - 1700 nm
Maximum Measurement Rate	333 Samples per second			
SOP Accuracy	±0.25° on Poincaré Sphere			
SOP Resolution	0.01° on Poincaré Sphere			
DOP Accuracy	±0.5%			
DOP Resolution	0.0001			
Dynamic Range	-60 to 10 dBm			
Width	2 TXP Slots			
Optical Input Connector	FC/PC			
Warm Up Time for Rated Accuracy	<15 min			
Analog Interface (via Front Panel D-Sub)	5 Analog Outputs: s1, s2, s3, DOP, Power 1 Analog Input: Trigger			
Digital Interface	s1, s2, s3, Power (Watt/dBm), DOP, Azimuth, Ellipticity			
Analog Monitor Output	-2.5 to 2.5 V			
Operating Temperature Range	5 to 40 °C			
Storage Temperature Range	-40 to 70 °C			

Free-Space Polarimeter Specifications

Item #	UPAX5710VIS-T	UPAX5710IR1-T	UPAX5710IR2-T	UPAX5710R3-T
Wavelength Range	400 - 700 nm	700 - 1000 nm	1000 - 1350 nm	1300 - 1700 nm
Maximum Measurement Rate	333 Samples per second			
SOP Accuracy	±0.25° on Poincaré Sphere			
SOP Resolution	0.01° on Poincaré Sphere			
DOP Accuracy	±0.5%			
DOP Resolution	0.0001			
Dynamic Range	-60 to 10 dBm			
Free Space Aperture	Ø3 mm			
Maximum Input Beam Divergence	2°			
Width	1 TXP Slot			
Warm Up Time for Rated Accuracy	<15 min			
Analog Interface (via Front Panel D-Sub)	5 Analog Outputs: s1, s2, s3, DOP, Power 1 Analog Input: Trigger			
Digital Interface	s1, s2, s3, Power (Watt/dBm), DOP, Azimuth, Ellipticity			
Analog Monitor Output	-2.5 to 2.5 V			
Operating Temperature Range	5 to 40 °C			
Storage Temperature Range	-40 to 70 °C			

Note: All data are valid at 23 ±5°C and 45 ± 15% relative humidity.