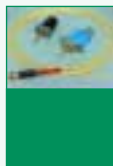




Photodetectors

Page



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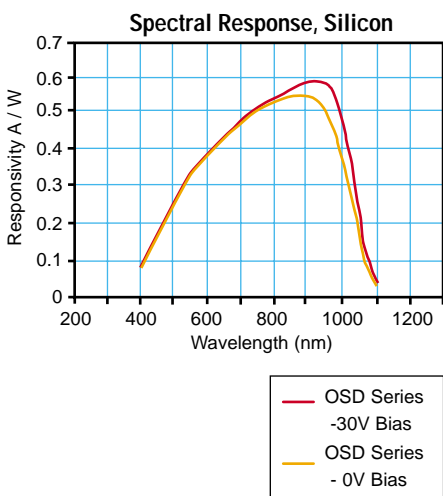
Standard Silicon Photodetectors

OSD Series

The Series 0 general purpose silicon photodiodes are designed to operate with a reverse bias voltage of up to 50 volts for applications where low capacitance or fast speed of response are important.

These photodiodes are fabricated to maximise their responsivity in the 780 - 930nm range. The typical responsivity at 900nm is .54 A/W.

For pulsed applications, the devices exhibit good performance throughout the 430nm to 1064nm spectral range.

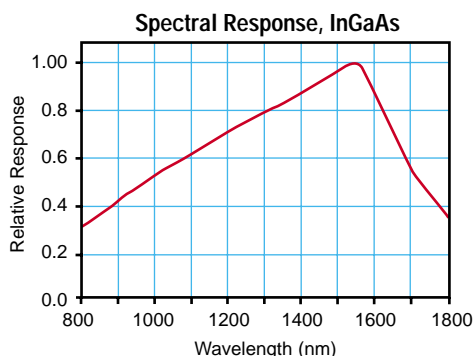


Standard InGaAs PIN Photodetectors

FD Series

High speed, low dark current, low capacitance photodiode for high speed communication systems, LANs, and FDDI applications. The 150 micron diameter photosensitive area improves coupling to multimode fibre using active device receptacles. Planar-passivated device structure.

General purpose InGaAs photodiodes useful for a wide range of applications including infrared instrumentation and moderate speed communication systems. The photosensitive area is 300 microns in diameter.



Calibrated Photodetectors

GRO Series

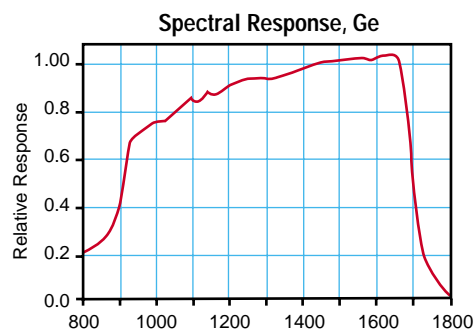
The GRO-Series of photodiodes are standard photodiodes that have been calibrated against a recognised standard source to provide a highly accurate means of measuring different wavelengths of signals across a wide wavelength range at room temperature.

The Model 260 silicon detector provides highly sensitive measurements in the 650-950 nanometre region, while the Model 261 germanium and Model 280 (InGaAs) detectors are capable of a wide range of measurements between 800 and 1800 nanometres.

With the 280, the power meter handles measurements down to -85 dBm at 1300nm and 1550nm.

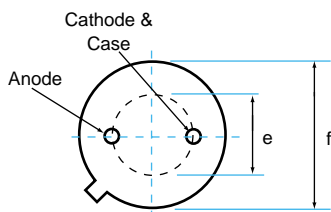
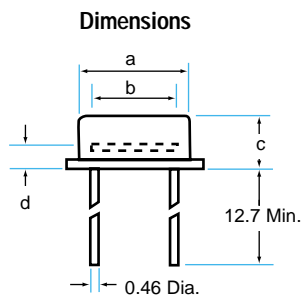
Laser 2000 GRO series detectors are provided with a computer generated calibration. This calibration lists wavelength vs. absolute and relative responsivity. Special calibrations of these are available.

In the manufacturing process, our instruments are calibrated with a secondary standard, one that is directly derived from a primary standard of a national standards lab, such as the National Institute of Standards and Technology (NIST) in the United States. NIST calibrates the spectral responsivity of the secondary standard at 25°C and at a power level of about 10 µW.



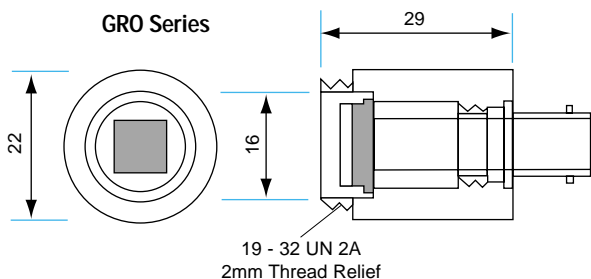
Silicon & InGaAs Photodetectors

Type	Active Area mm ² mm	Wavelength Response Range, R>0.1 A/W		Peak Responsivity nm, Typ. A/W, Typ.	Dark Current (nA)		Capacitance, pF			Shunt Resistance, Mohms			Risetime, nsec At peak response	Package TO type		
		Vr = 0V @ 25°C, nm, Typ.	nm, Typ.		Max.	Typ.	Vr = 0V	Vr = 5V	Vr = 30V	Vr	Vr = 0V	Typ.				
Silicon																
OSD 1-0	Si	1	1.0 x 1.0	400 - 1100	900	0.55	3	1	12	-	3	50	-	-	10	18 (1)
OSD 5-0	Si	5	2.52	400 - 1100	900	0.55	10	5	50	-	8	50	-	-	8	5 (1)
OSD 8.5-0	Si	8.5	2.9 x 2.9	400 - 1100	900	0.55	12	5	70	-	10	50	-	-	8	5 (1)
OSD 15-0	Si	15	3.8 x 3.8	400 - 1100	900	0.55	15	8	150	-	20	50	-	-	9	5 (1)
OSD 19.5-0	Si	19.5	4.4 x 4.4	400 - 1100	900	0.55	20	10	170	-	25	50	-	-	10	8 (1)
OSD 35-0	Si	35	5.9 x 5.9	400 - 1100	900	0.55	30	12	350	-	46	50	-	-	12	8 (1)
OSD 60-0	Si	58	7.6 x 7.6	400 - 1100	900	0.55	50	15	600	-	75	50	-	-	15	8 (2)
InGaAs																
FD-150-W	InGaAs PIN	0.017	0.15	800 - 1800	1300 - 1550	0.85	0.5	3	-	2	-	25	-	-	0.3	18 (2)
FD-300-W	InGaAs PIN	0.07	0.3	800 - 1800	1300 - 1550	0.85	1	5	-	7	-	20	-	-	0.4	18 (2)
FD-1000-W	InGaAs PIN	0.8	1	800 - 1800	1300 - 1550	0.85	-	-	80	-	-	2	2	20	-	18 (2)
FD-1500-W	InGaAs PIN	1.8	1.5	800 - 1800	1300 - 1550	0.85	-	-	300	-	-	2	2	10	-	18 (2)
FD-2000-W	InGaAs PIN	3.1	2	800 - 1800	1300 - 1550	0.85	-	-	400	-	-	2	1	10	-	5 (2)
FD-3000-W	InGaAs PIN	7	3	800 - 1800	1300 - 1550	0.85	-	-	750	-	-	2	1	2	-	5 (2)
FD-5000-W	InGaAs PIN	19.5	5	800 - 1800	1300 - 1550	0.85	-	-	2000	-	-	1	0.1	0.5	-	8 (3)



Dimensions in mm (approx.)

	T05 (1)	T05 (2)	T08 (1)	T08 (2)	T08 (3)	T018 (1)	T018 (2)
a	8.2 Dia.	8.3 Dia.	12.3 Dia.	14.0 Dia.	12.4 Dia.	4.65 Dia.	5.4 Dia.
b	5.9 Dia.	4.5 Dia.	10.9 Dia.	11.1 Dia.	10.9 Dia.	3.9 Dia.	4.6 Dia.
c	3.3	4.8	5.1	4.3	3.8	5.1	3.6
d	2.0 Nom.	3.1Nom	1.7 Nom	2.0 Nom.	-	3.0 Nom	3.3 Nom
e	5.08 Dia.	5.1 Dia.	7.5 Dia.	10.2 Dia.	7.4 Dia.	2.54 Dia.	2.5 Dia.
f	9.2 Dia.	9.1 Dia.	14.0 Dia.	15.3 Dia.	14.0 Dia.	5.4 Dia.	5.4 Dia.



Dimensions in mm (approx.)

Calibrated Photodetectors

		GRO 260	GRO 261	GRO 280
Sensor Material		Silicon	Germanium	InGaAs
Active Area	mm	0.34	0.2	0.07
Effective Aperture	mm dia.	-	-	3
Wavelength range	nm	400 - 1100**	800-1800	800-1800
Calibration Interval	nm intervals	20	25	10
Calibration Accuracy	±%	3	3	3
Linearity	±%	0.5	1	0.5
Responsivity	AWW, min.	0.55 @ 850nm	0.7 @ 1300nm	0.85 @ 1300nm
Frequency Response	Hz	DC-286kHz (at 0V)	DC-1MHz (at -3VDC)	DC use only
Shunt Resistance	Ohms	10M-60M	14k	>1M
Shunt Capacitance	pF, typ.	0.1	3	-
NEP @ 100Hz	W/Hz ^{1/2}	-5	-5	-2
Breakdown Voltage	V	10e-12 to 1e-3	320e-12 to 2e-3	1e-12 to 2e-3
Range	Watts	-90 to +0	-65 to +3	-90 to +3
Package type		-	-	-

** Actual range is 360-1100 but calibration accuracy not guaranteed below 400nm.

Options	Description
GRO 1745	FC/PC Adaptor for GRO Series
GRO 1749	ST Adaptor for GRO Series



PDSI / R-11 / PDGA Series

Pigtailed Photodetectors

The Laser 2000 range of in-line pigtailed detectors is designed for use with visible and infrared laser systems operating within optical fibre. These systems are supplied pigtailed with industry standard connectors for connecting directly to the fibre-optic cable. They may be used in conjunction with other fibre-optic components to provide a direct feedback of the optical transmission signal, a measurement of fluorescence response in fluorescence systems or alternatively the receiver in an optical transmission system. Three different detector types are offered, a pigtailed silicon detector for visible and near infrared work, an InGaAs PIN photodiode and a Germanium avalanche photodiode for use in the near infrared and infrared. All of these detectors benefit from being negatively biased and the signals amplified using the PDA 700 detailed on page 3.

Silicon: PDSI Series

The PDSI series is a pigtailed Silicon photodiode delivering peak response across the 400-1100nm wavelength range. The responsivity peaks at approximately 850nm with a value of typically 0.35A/W. Using the PDA700, currents as low as a few picoAmp may be detected flowing in the detector corresponding to just a few picoWatts of power on the detector. This highly sensitive detector is multimode fibre pigtailed and has a 3dB bandwidth of 1.5GHz making it capable of being used to measure high speed signals. Silicon photodetectors should be used to measure visible and NIR wavelength sources. Longer wavelengths should be detected with the InGaAs detectors detailed below.

InGaAs: R-11 Series

The R-11 series is a pigtailed InGaAs PIN photodiode delivering peak response across the 800-1800nm wavelength range. The responsivity peaks at approximately 1300-1550 nm with a value of typically 0.85A/W. Using the PDA700, currents as low as a few picoAmp may be detected flowing in the detector corresponding to just a few picoWatts of power on the detector. This highly sensitive detector is singlemode fibre pigtailed and has a 3dB bandwidth of 2GHz making it capable of being used to measure high speed signals. The InGaAs detector is particularly suited to measuring low amplitude signals in the infrared range 1000-1800nm. It is particularly sensitive when compared with Germanium detectors for sensing wavelengths in the 1300-1600nm window at room temperature.

Pigtailed Photodetectors

		PDSIU500200A-0-0-01	PDSIU500100A-0-0-01	R-11-075-P-SFC
Material		Silicon	Silicon	InGaAs/InP PIN
Active Area	µm	500	500	75
Wavelength range	nm	400-1100	400-1100	1100-1650
Responsivity	AWW, min.	0.35 @ 850nm	0.35 @ 850nm	0.8 @ 1310nm
	AWW, max.	0.45 @ 850nm	0.45 @ 850nm	0.95 @ 1310nm
Capacitance	pF, typ.	2.5	2.5	0.7
	pF, max.	-	-	0.9
Dark Current	nA, typ.	0.1	0.1	0.5
	nA, max.	1	1	0.8
Bandwidth, 3dB	GHz	1.5	1.5	2
Bias	V	10	10	5
Fibre type		multimode	singlemode	singlemode
	µm	50/125/900	9/125/900	9/125/900
Pigtail length	m	1	1	1
Connector		none	none	FC/PC



ET Series

Up to 10GHz!

ET3010 & ET3500 also available
in Freespace Option at No
Additional Cost! (See Following Page)

Biased and Amplified Photodetectors, Freespace

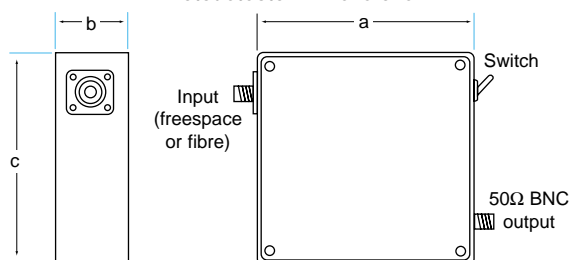
ET Series

The Laser 2000 range of biased photodetectors delivers much higher bandwidths and higher responsivities than may be achieved with bare un-biased detectors. This is achieved as the reverse bias creates a strong electric field in the p-n junction which increases the drift velocity of the carriers, reducing their transit time. At the same time, the reverse bias also increases the width of the depletion layer, thereby reducing junction capacitance and improving the response time. Furthermore, the increased width of the depletion layer leads to a larger photosensitive area which makes it much easier to collect more light.



Use for Relative Intensity
Measurement - for Absolute
Power Measurements, see
Photodiode Amplifiers - Pages 6 - 9
& Power Meters

Photodetector Dimensions

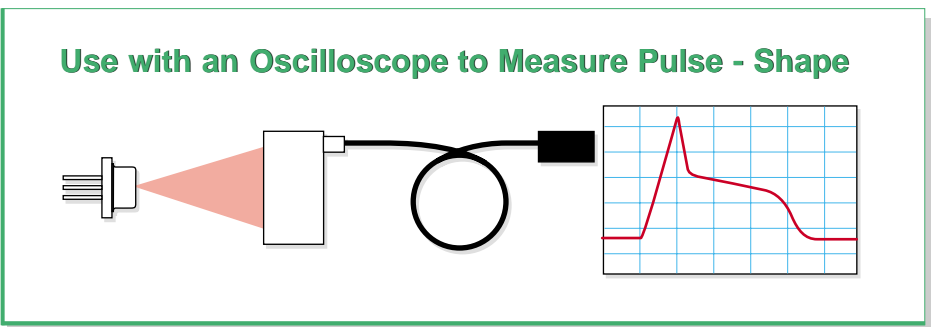


Dimensions in mm (nominal)

	a	b	c
ET Series - Biased Si and InGaAs	30	30	60
Amplified - 2030A / ET-3000A	30	30	60
>10GHz - ET3500	80	30	80
>10GHz - ET4000	50	30	80
TIA	-	-	-

	Silicon					InGaAs			
	Biased		Amplified			Biased		Amplified	
	ET-2040	ET-2020	ET-2030	ET-2000	ET-2030A	ET-3020	ET-3000	ET-3000A	
Detector Type	Si Pin	Si Pin	Si Pin	Si Pin	Si Pin	InGaAs PIN	InGaAs PIN	InGaAs PIN	
Biased or Amplified	Biased	Biased	Biased	Biased	Amplified	Biased	Biased	Amplified	
Free-space or Fibre Connectorised	Free-space	Free-space	Free-space	Free-space	Free-space	Free-space	Free-space	Free-space	
Wavelength Range	nm	400 - 1100	190 - 1100	400 - 1100	400 - 1100	400 - 1100	800-1800	800-1800	
Bandwidth		DC-25MHz	DC-100MHz	DC-1.2GHz	DC-1.5GHz	75kHz-1.2GHz	DC-2.5MHz	DC-2GHz	75kHz-1.5GHz
Interstage Coupling		DC	DC	DC	DC	AC	DC	DC	AC
Risetime	psec	<30000	<1500	<300	<200	<500	<100000	<200	<400
Fall times	psec	<30000	<1500	<300	<350	<500	<100000	<200	<400
Sensitivity @ 830nm	A/W	0.5	0.5	0.4	0.4	-	-	-	-
Sensitivity @ 830nm	V/W	-	-	-	-	500	-	-	-
Sensitivity @ 1300nm	A/W	-	-	-	-	-	0.8	0.8	-
Sensitivity @ 1300nm	V/W	-	-	-	-	-	-	-	400
Bias Voltage	Volts	24	48	9	3	0	6	6	-
Active Area	mm ²	20	5.1	0.12	0.006	0.12	7	4.40E-03	75µm dia.
Input Acceptance Angle	°	41	30	10	25	10	30	25	20
Output Connector		BNC	BNC	BNC	BNC	BNC	BNC	BNC	BNC
Dark current	A	<20nA	<10nA	<0.1nA	<1nA	-	2000nA	<1nA	-
Junction Capacitance	F	<45pF	<25pF	<1.5pF	<4pF	-	<1300pF	<0.75pF	-
Dynamic Range for 0.5V across 50 Ohm	dB	60	60	60	60	-	60	60	-
Maximum Continuous Output Current	A	10mA	10mA	10mA	50mA	-	10mA	10mA	-
Maximum Undistorted Output Voltage	V, P-P	-	-	-	-	500mV	-	-	200mV
Maximum Linear Input Power	mW	-	-	-	-	-	-	-	-
Noise	W/HzE-1/2	<1.6E-13	<1e-12	<1.5E-15	<1e-13	-	<1E-12	<1E-13	-
Noise	A/HzE-1/2	-	-	-	-	7pA	-	-	6pA
Min. Detectable Pulse Power**		1mW	1mW	1mW	1W	1µW	1mW	1mW	1µW
Power Supply		240V AC adaptor only	240V AC adaptor only	3V Lithium cell or optional AC adaptor	3V Lithium cell or optional AC adaptor	240V AC adaptor only	None required	3V Lithium cell or optional AC adaptor	240V AC adaptor only

** For higher sensitivity, turn to page 6



Biased and Amplified Photodetectors, Fibre Connectorised

ET Series / TIA Series



Standard Detectors - Page 2

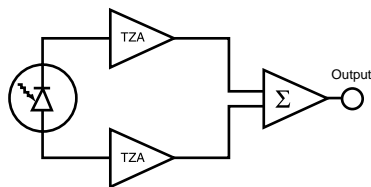
Fibre connectorised biased & amplified detectors provide a simple means of connecting an FC connectorised laser source or signal output to an oscilloscope for eye pattern or temporal profile analysis.

Biased detectors should be used where signal strength does not require amplification. Amplified detectors should be considered for those applications where signal attenuation is significant.

		Silicon		InGaAs				
		Amplified TIA-500ST	Biased ET-3010	Biased ET-3500	TIA-500I	Amplified TIA-950	Amplified TIA-4000	TIA-3000
Detector Type		Si Pin	InGaAs PIN	InGaAs PIN	InGaAs PIN	InGaAs PIN	InGaAs APD	InGaAs PIN
Biased or Amplified		Amplified	Biased	Biased	Amplified	Amplified	Amplified	Amplified
Free-space or Fibre connectorised		Fibre-connectorised		Fibre-connectorised	Fibre-connectorised	Fibre-connectorised	Fibre-connectorised	Fibre-connectorised
Wavelength Range	nm	400 - 1100	800-1800	800-1800	800-1800	800-1800	800-1800	800-1800
Bandwidth		DC-125MHz	DC-2GHz	DC-10GHz	DC-125MHz	DC-750MHz	30kHz - 7GHz	100kHz-8.5GHz
Interstage Coupling		AC or DC, switchable	DC	DC	AC or DC, switchable	AC or DC, switchable	NA	NA
Risetime	psec	-	<200	<30	Not specified	Not specified	Not specified	Not specified
Fall times	psec	-	<200	<30	Not specified	Not specified	Not specified	Not specified
Sensitivity @ 830nm	AW	-	-	-	-	-	-	-
Sensitivity @ 830nm	V/W	100000	-	-	-	-	-	-
Sensitivity @ 1300nm	AW	-	0.8	0.8	-	-	-	-
Sensitivity @ 1300nm	V/W	-	-	-	100000	12000	2500	450
Bias Voltage	Volts	0	6	9	-	-	-	-
Active Area	mm ²	-	4.40E-03	40µm dia.	-	-	-	-
Acceptance Angle	°	10	FC/APC,	FC/APC,	ST or FC,	FC,	FC, 0.23 NA	FC, 0.23 NA
			0.29 NA	0.29 NA	0.29 NA	0.29 NA	(50µm MM)	(50µm MM)
Output Connector		BNC	BNC	BNC	BNC	BNC	SMA	SMA
Dark current	A	-	<1nA	<5nA	-	-	-	-
Junction Capacitance	F	-	<0.75pF	0.9pF	-	-	-	-
Dynamic Range for 0.5V across 50 Ohm	dB	-	60	-	-	-	-	-
Maximum Continuous Output Current	A	-	10mA	-	-	-	-	-
Maximum Undistorted Output Voltage	V, P-P	500mW	-	-	2V	1V	0.65V	0.65V
Maximum Linear Input Power	mW	-	-	-	1.2	0.8	1	2.5
Noise	W/HzE-1/2	-	<1E-13	-	-	3pW	16pW	15pW
Noise	A/HzE-1/2	3pA	-	-	3pA	-	-	-
Min. Detectable Pulse Power*		-	1mW	1mW	-	-	-	-
Power Supply		9V Lithium Battery. Optional AC adaptor	3V Lithium cell or optional AC adaptor	3V Lithium cell or optional AC adaptor	240V AC adaptor only	9V Lithium battery or optional AC adaptor	220VAC adaptor only	220VAC adaptor only



LASER 2000 Photodetectors



High Sensitivity Photodetectors

OPM

Measurement Principle

The OPM series of optical power monitors employs photodiodes to measure optical power. Precision dual transimpedance input stages provide for high common mode rejection and linearity throughout the full dynamic range of the system.

Fields of Application

These optical power monitors are particularly useful for the measurement and monitoring of optical power in the standard telecommunications bands. The output is a voltage linearly proportional to power. The fast response time at high signal-noise-ratio makes the OPM series particularly useful in systems control feedback loops, such as in fibre alignment systems. The high sensitivity and wide dynamic range allow measurement of fibre coupled lasers and LEDs alike.

Several options of photodiode material and optical input, including free beam input, make these units useful in a wide range of applications including non-telecom metrology.

The OPM series is insensitive to electromagnetic interference by design, an important factor when working in "dirty" industrial environments. The case wings provide for mounting on standard 25mm and 1" optical table tops and for OEM applications.

Options

Number of channels	1 to 16
Photodiode material	InGaAs (950 – 1650 nm) Si (450 – 1000 nm)
Optical input	FC, ST, SC, FSMA, free beam

OPM Specifications

Parameter	Conditions	Min	Typ	Max
Input				
Wavelength range	nm	InGaAs 950 Si 450		1650
Power ranges (full scale)	dBm		0 -10 -30	
Noise equivalent power (NEP _{RMS})	dBm	Range: 0dBm -10dBm -30dBm		-45 -55 -75
Polarisation Dependant Loss (PDL)	dB		0.02	0.1
Fibre type			single mode, multi-mode (ϕ core $\leq 62,5 \mu\text{m}$; NA ≤ 0.275)	
Receptacles			FC, SC, ST, FSMA, free beam	
Output				
Function			Linear analogue $V_{out} = \text{scale} \times P_{in}$	
Connectors			BNC ¹ and DB9	
Output scale	mV/ μW	Range: 0dBm -10dBm -30dBm	10 100 10 000	
Rise / Fall time (10% - 90%)	μs			50 ²
Accuracy	%		± 5	
Reproducibility	%		± 0.5	
Linearity	dB		± 0.1	± 0.2
Output impedance	Ω			1 ³
Logic				
Dead time during change of range	ms			5
Switching time (remote mode)	ms			10
Power Supply				
Type			Wall plug (supplied)	
Dimensions	mm		52 x 68 x 112	
Dimensions				
	mm	1 channel	105 ⁴ x 45 x 116 mm (w x h x l)	
	mm	2 channels	105 ⁴ x 66 x 116 mm (w x h x l)	
	mm	4 channels	105 ⁴ x 106 x 116 mm (w x h x l)	
		> 4 channels	19" rack	

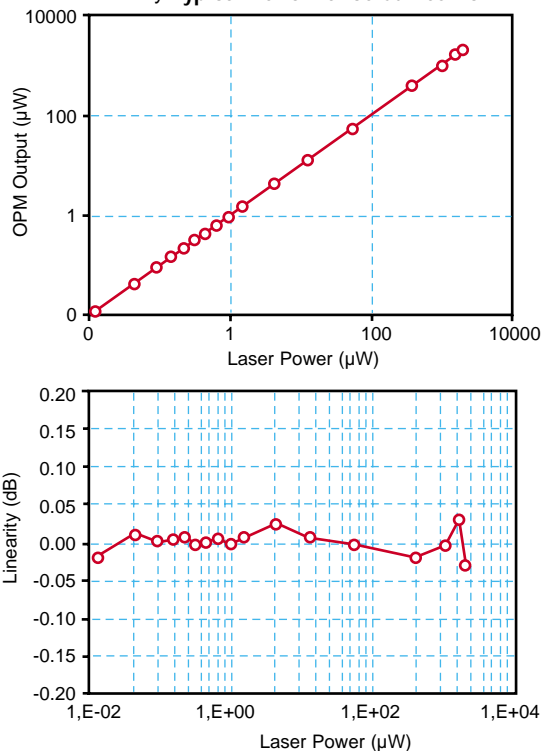
¹ Adapters for other connector systems available ² Faster units available upon request
³ 50 Ω available upon request ⁴ 130 mm including case wings

Absolute Maximum Ratings

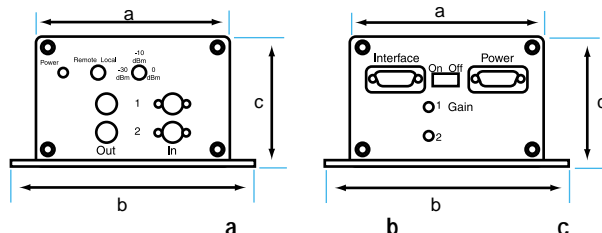
Average Optical Power	+7 dBm (5mW)
Temperature Range	0 - 60°C

For Absolute Power Measurements with -75dBm Sensitivity!

Linearity Typical Performance Curves - OPM



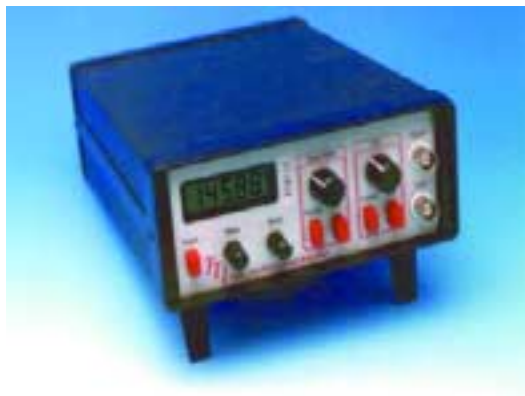
OPM Dimensions



	a	b	c
1 Channel	105mm	130mm	45.03mm
2 Channels	105mm	130mm	65.53mm
4 Channels	105mm	130mm	106.08mm

Also available as TIA Only - Page 7

Product Code	Gain Ranges	Number of Detectors	Wavelength Range
Silicon			
OPM-4-1-SI	3	1	450-1000nm
OPM-4-2-SI	3	2	450-1000nm
OPM-4-4-SI	3	4	450-1000nm
OPM-5-1-SI	6	1	450-1000nm
OPM-5-2-SI	6	2	450-1000nm
OPM-5-4-SI	6	4	450-1000nm
InGaAs			
OPM-4-1-IGA	3	1	950-1650nm
OPM-4-2-IGA	3	2	950-1650nm
OPM-4-4-IGA	3	4	950-1650nm
OPM-5-1-IGA	6	1	950-1650nm
OPM-5-2-IGA	6	2	950-1650nm
OPM-5-4-IGA	6	4	950-1650nm



PDA-700

Photodiode Transimpedance Amplifier

PDA-700

- 7 decade dynamic range
- Less than 1 pA noise
- Maximum resolution 1 part in 20,000
- Rechargeable Ni-Cad batteries
- Digital input of A/W value provides direct readout in Watts
- Digital input of bias voltage to $\pm 10V$
- Background cancelling of noise
- Backlit display for use in darkened labs

The PDA-700 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 other similar current source. With full scale input ranges of 10 nA to 1 mA (with 100 % over range) and a noise level of less than 1 pA, the PDA-700 offers superb dynamic range.

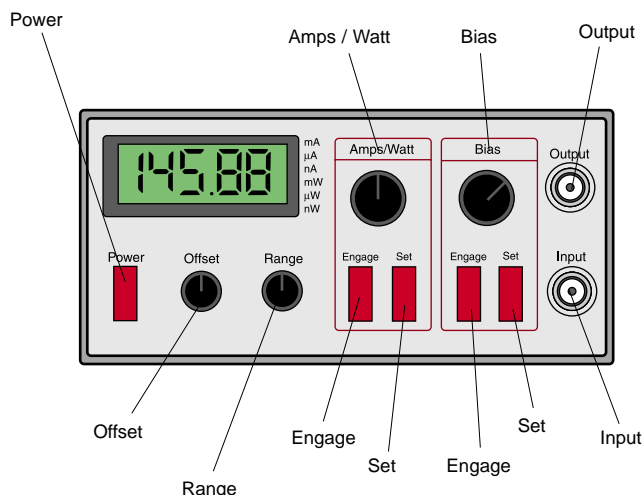
Digital selection of a calibration factor in terms of Amps/Watt via the front panel controls permits the unit to display the measurement directly in terms of Watts. The A/W setting may range from 1.0000 to 0.1000. Subsequent current readings are divided by this cal factor when the Amps / Watt control is engaged.

A variable bias voltage ranging from +10 V to -10 V may be digitally selected from the front panel and applied in series with the photodiode under test. The background cancellation feature allows offsets of from +200 % to -200 % of the selected full scale range to be added or subtracted from the input signal.

Rechargeable batteries isolate the unit from the mains and eliminate the effects of ground loops and/or power line noise. They will provide power to the unit for a minimum of 20 hours of operation between charges. The unit may be operated normally while the batteries are charging.

The large 4 1/2 digit Liquid Crystal Display provides a maximum resolution of 1 part in 20 000 thus permitting the detection of very small changes in the variable that is to be measured. The display is also equipped with an LED back-light that permits it to be read in a darkened laboratory.

An analog output is provided with a 2 volt full-scale signal that is proportional to the maximum display reading of 20 000



For Use With:



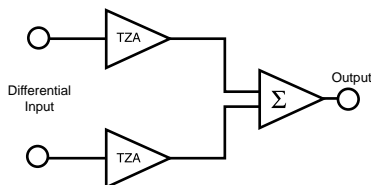
Freespace Photodetectors
- Page 2



Pigtailed Photodetectors
- Page 3

Specifications

Full Scale Ranges	+/- 20 nA to 2.0 mA in Decade Steps
Max Input without damage	+/- 10 mA
Accuracy	+/- 0.5% Rdg. +/- 2 L.S.D.
Amps / Watt Setting	0.1000 to 1.0000
Amps / Watt Setting Accuracy	+/- 0.5% Rdg. +/- 2 L.S.D.
Input Impedance	0 Ohms, Single Ended
Input capacitance	25 pF
Output Impedance	100 Ohms
Bias Voltage	-10 V to +10 V
Drift	<20 pA/hr. after 10 minute warm up period
Voltage Noise	<1.1 μV , DC to 10 Hz
Noise	<1 pA with <10 pF Det.
Background Cancellation	+/- 200 % of range in use
Temperature Coefficient	< 2 pA / $^{\circ}C$
Frequency Response	DC to 2000 Hz
Display	4 1/2 Digit, 0.4" High LCD with LED Back Lighting
Maximum Resolution	1 part in 20,000
Power Requirements	Rechargeable Ni-Cad Batteries provide approximately 20 hours of use
External Supply	110 or 240 VAC, 50 - 60 Hz, 15 W max.
Dimensions	6.5" W, 9" L, 2.75" H 16.5 cm, 23 cm, 7 cm
Weight	3 Lbs., 1.36 kg Excluding External Supply
Operating Temperature	0 - 40 C



High Sensitivity Transimpedance Amplifier

TZA

Measurement Principle

The TZA series of amplifiers employs precision dual transimpedance input stages to provide for high common mode rejection and linearity throughout the full dynamic range.

Fields of Application

These transimpedance amplifiers are particularly useful for the measurement of current from photodiodes. The output is a voltage linearly proportional to input current and thus, to input power in photodiode monitoring applications. The fast response time at high signal-noise-ratio makes the TZA series particularly useful in systems control feedback loops. The high sensitivity and large dynamic range allow measurement of a wide range of optical sources such as lasers and LEDs via a variety of photodiodes for these applications such as Si and InGaAs.

The TZA series is insensitive to electromagnetic interference by design, an important factor when working in "dirty" industrial environments. The case wings provide for mounting on standard 25mm and 1" optical table tops and for OEM applications.

Options

Number of channels	1 to 16
--------------------	---------

TZA Specifications

Parameter	Condition	Min	Typ	Max
Input				
Current ranges (full scale)	mA		10	
	μA		100	
	μA		1	
Noise equivalent current (NEI _{RMS})	μA	Range: 10mA		300
	nA	100μA		3
	nA	1μA		30
Connectors	pA		BNC ¹	
Output				
Function		Linear analogue $V_{out} = scale \times I_{in}$		
Connectors		BNC ¹ and DB25		
Output scale	V/mA	Range: 10mA	1	
	V/μA	100μA	0.1	
	V/μA	1μA	10	
Rise / Fall time (10% - 90%)	μs			25 ²
Settling time (1%)	μs			50 ²
Accuracy	%		± 1	
Output impedance	Ω			50 ³
Logic				
Dead time during change of range	ms			5
Switching time (remote mode)	ms			10
Power Supply				
Type		Wall plug (supplied)		
Dimensions	mm	52 x 68 x 112		
Dimensions				
	mm	1 channel	105 4 x 45 x 116 mm (w x h x l)	
	mm	2 channels	105 4 x 66 x 116 mm (w x h x l)	
	mm	4 channels	105 4 x 106 x 116 mm (w x h x l)	
		> 4 channels	19" rack	

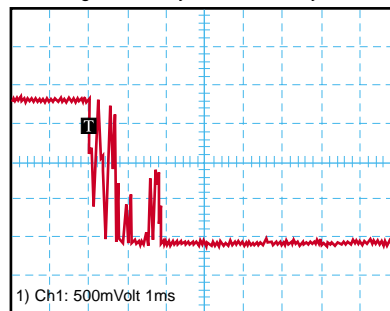
¹ Adapters for other connector systems available ² Faster units available upon request
³ 1 Ω available upon request ⁴ 130 mm including case wings

Absolute Maximum Ratings

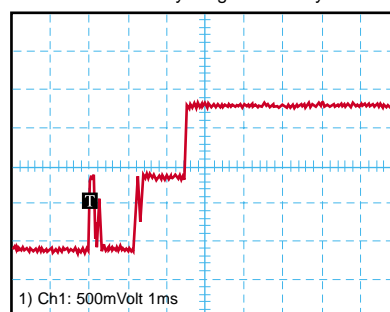
Average Current	15mA
Temperature Range	0 - 60°C

Typical Performance Curves - OPM & TZA

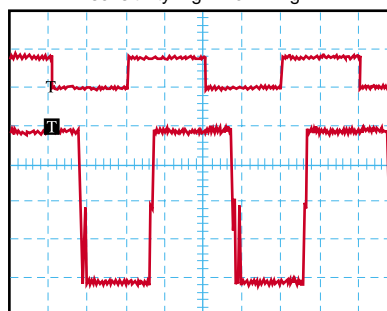
Gain Switching Dead Time (Local Mode)
high sensitivity - low sensitivity



Gain Switching Dead Time (Local Mode)
low sensitivity - high sensitivity

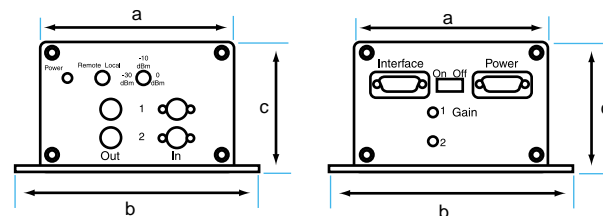


Gain Switching Time (Remote Mode)
sensitivity high - low - high



upper trace:
Remote control voltage
(HI = high sensitivity,
LO = low sensitivity)

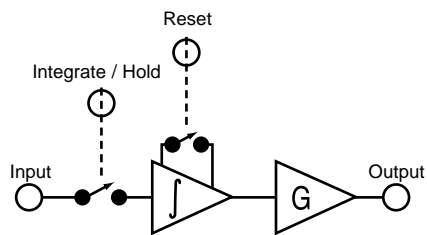
lower trace:
OPM / TZA output



Dimensions (OPM, TZA & GIA)

	a	b	c
1 Channel (OPM & TZA)	105mm	130mm	45.03mm
2 Channels (OPM, TZA & GIA)	105mm	130mm	65.53mm
4 Channels (OPM, TZA & GIA)	105mm	130mm	106.08mm

Product Code	Gain Ranges	# Channels
TZA-4-1	3	1
TZA-4-2	3	2
TZA-4-4	3	4
TZA-5-1	6	1
TZA-5-2	6	2
TZA-5-4	6	4



High Sensitivity Gated Integrating Amplifier

GIA

Measurement Principle

The GIA series of gated integrating amplifiers employ dual monolithic switched integrators. This design results in very low leakage error, charge injection error and pickup. The precision input stage may be configured for current or voltage inputs, providing flexibility for the user.

Fields of Application

The GIA series of gated integrators is useful for signal processing in a wide range of applications such as photodiode monitoring and time domain signal analysis. The output is a voltage linearly proportional to the integral of the input during a period of time set by a TTL-compatible gate. Between gates, the output is held constant for readout or digital conversion via an external A/D-converter or I/O-card (not included).

The fast response time at high signal-noise-ratio makes the GIA series particularly useful in systems control feedback loops and online production control.

The GIA series is insensitive to electromagnetic interference by design, an important factor when working in „dirty“ industrial environments. The case wings provide for mounting on standard 25mm and 1“ optical table tops and for OEM applications. 19“ rack mounting is also available.

Dimensions are shown on previous page.



Options

Input	current or voltage
Scaling	1 / 3 / 10 / 30 or 1 / 10 / 100 / 1000

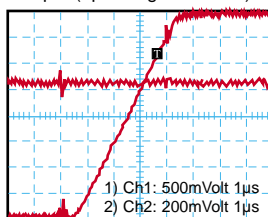
GIA Specifications

Parameter	Conditions	Min	Typ	Max
Input				
Current range		10pA	$V_{out} = \frac{scale}{100pF} \int I_{in} dt$	100µA
Voltage range		100µV	$V_{out} = \frac{scale}{1µs} \int V_{in} dt$	10V
Connectors				
Output				
Function			Linear analogue	
	Current input			
	Voltage input			
Output scale			1, 3, 10, 30 or 0.1, 1, 10, 100	
Connectors			BNC ¹ and DB9	
Settling time (0.1%)	µs			25 ²
Accuracy	%	± 3		
Linearity	FSR			± 0.1%
Output impedance	Ω			1 ³
Logic				
Switching time (integrate / hold, reset, gain)	µs			1
Power Supply				
Type			Wall plug (supplied)	
Dimensions	mm		52 x 68 x 112	
Dimensions				
	mm	2 channels	105 x 66 x 116 mm (w x h x l)	
	mm	4 channels	105 x 106 x 116 mm (w x h x l)	
		> 8 channels	19" rack	

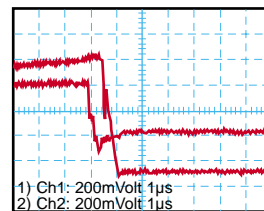
¹ Adapters for other connector systems available ² Faster units available upon request ³ 50 Ω available upon request

Performance

Output (4µs integration time)

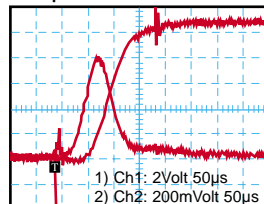


Input: 1.0 VDC Output: 1.0 V/µs

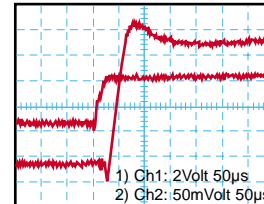


Input: 800mV 1.2µs FWHM Output: <1% Overshoot

Droop

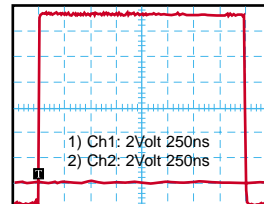


Upper trace: GIA output (1.5V) held for 400µs following 4µs integration lower trace: 2 VDC input



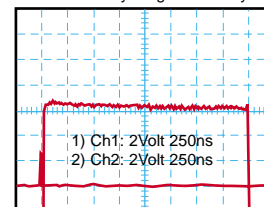
Upper trace: as previous graph; 4x expanded vertical scale

Gain Switching Dead Time high sensitivity - low sensitivity



(HI = high sensitivity, LO = low sensitivity)

low sensitivity - high sensitivity



outer traces: GIA output

Logic

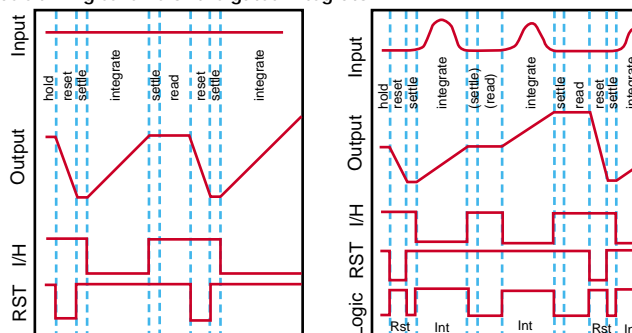
Logic control is via the interface, independent of the selection of Local / Remote. This instrument uses +5 V / 0 V (= digital ground) logic, which may be TTL.

Function	LO	HI
Integrate / Hold	integrate	hold
Reset	reset	enable

The status of the logic for each channel may be monitored by connecting the corresponding BNC logic monitor socket to an oscilloscope. This is useful for setting the gate positions and durations.

A typical measurement begins by resetting the channel in question by setting the "reset" wire LO. When the "reset" wire is set HI, the channel is enabled for integration and holding. The "integrate / hold" wire is then held LO for the period of time required for the integration. At the end of the integration period, the "integrate / hold" wire is switched to HI to hold the value to allow readout of the measurement. This sequence may now be repeated for further measurements.

Basic timing scheme of the gated integrator:



In order to improve the signal-to-noise ratio of repetitive signals, the GIA may be used to integrate isolated events as a „boxcar integrator“. In this case, the output is not reset between measurements, until the desired number of events have been integrated. This sequence is depicted in the diagram above right for a cumulated integration of 2 events.

Absolute Maximum Ratings

Average input	± 5 mA (current input mode)
	± 15 V (voltage input mode)
Temperature Range	0 – 60 °C

Product Code	Gain Ranges	# Channels
GIA-1-2	4	2
GIA-1-4	4	4