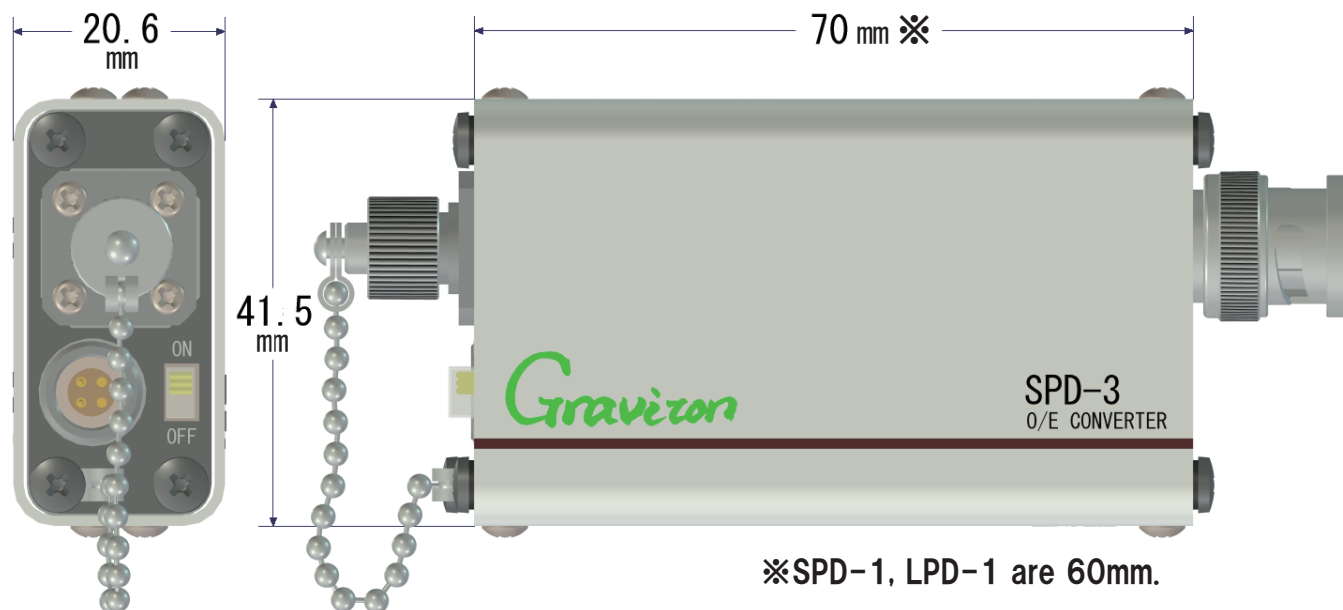


**Easy & Cost-Effective Opto Electronic Instrumentation**

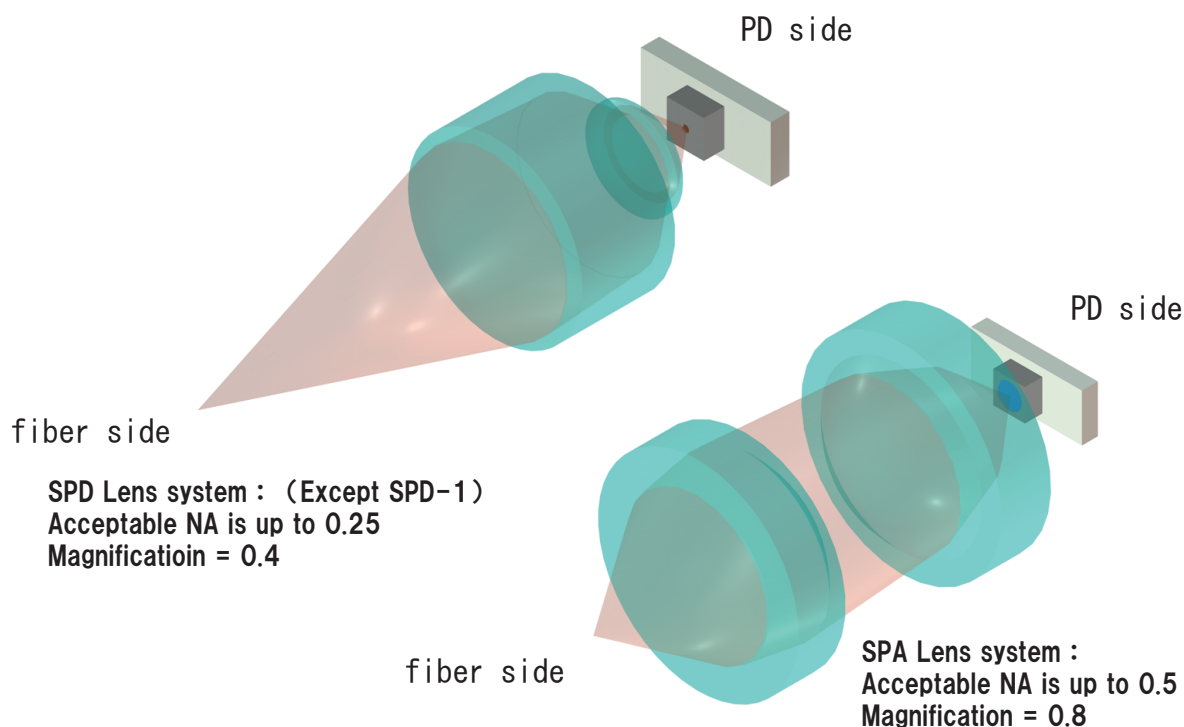
# ● Feature

- Optical to Electrical Conversion in Analog with Wide Bandwidth.
- Large Acceptable Core Diameter and Fiber NA.
- Compact Size.
- Easy to Use. Just Connect the Device to Your Electronic Measuring System.
- Suitable for Lightwave Instrumentation such as Optical link, Optical Pick-up, etc.

## ■ Physical Dimension

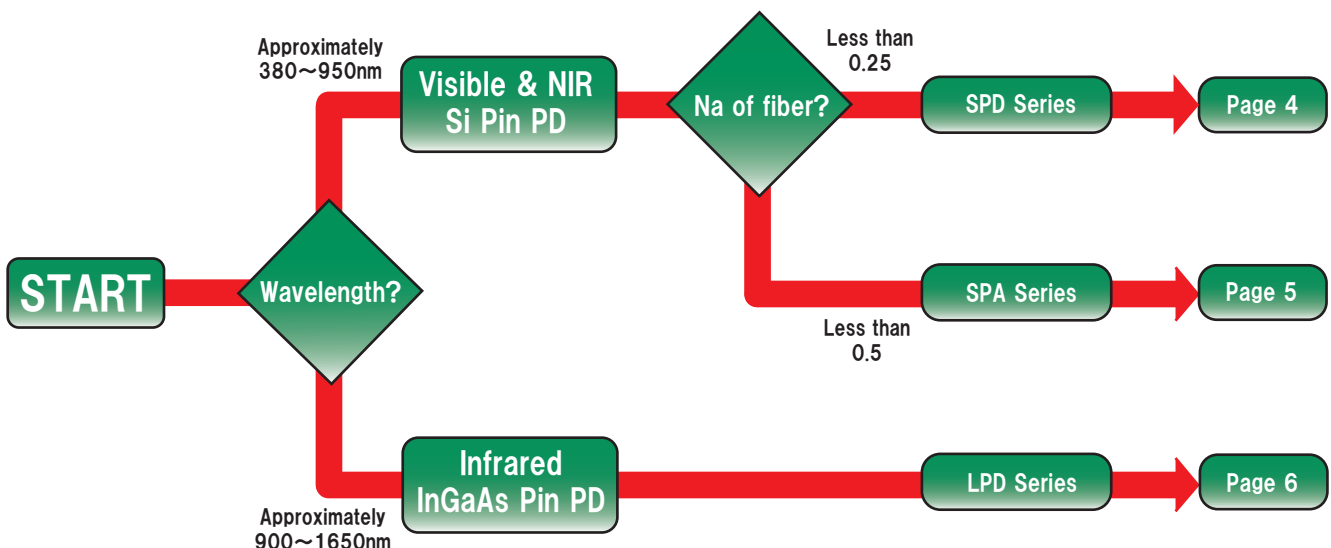
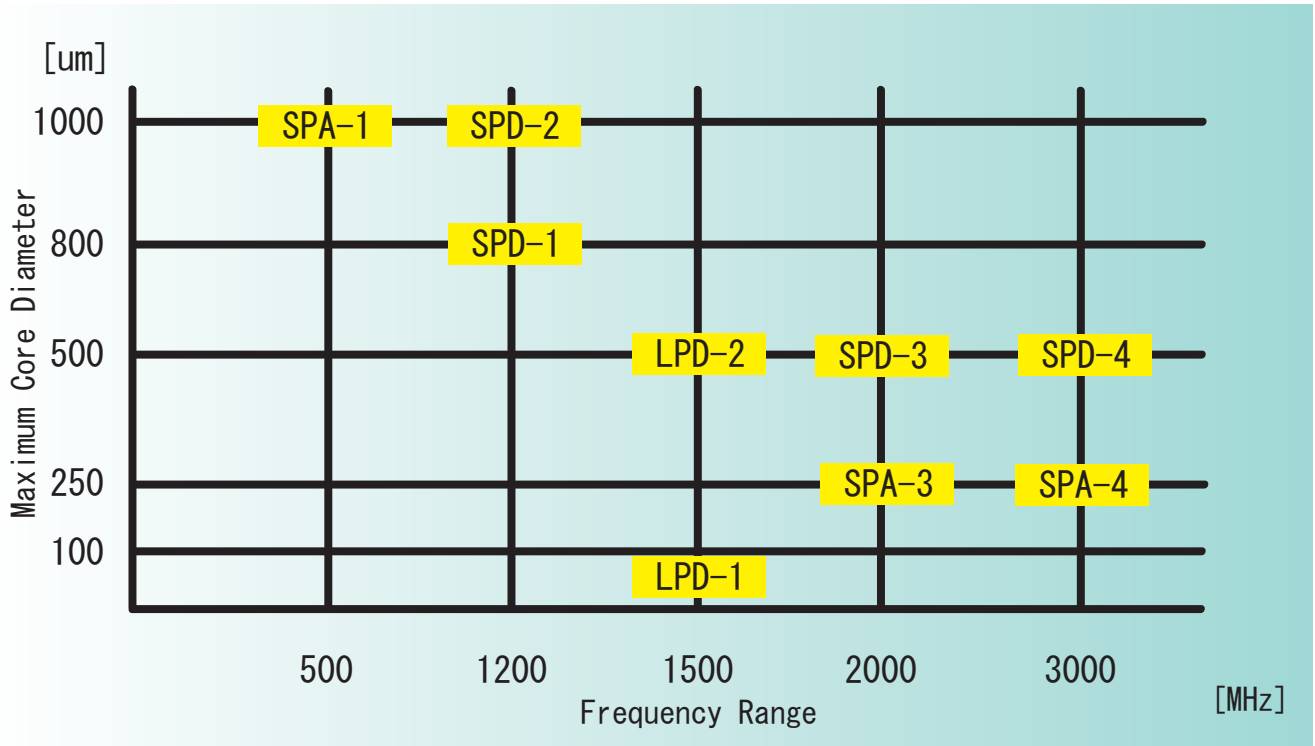


## ■ The Lens system of SPD & SPA series



# ● Selection of OE Converter

Choose the best suited converter considering the wavelength, the fiber NA, the core diameter, and the frequency range. We have wide variety of SPD series (Max NA = 0.25), SPA series (Max NA = 0.5), and LPD series (for long wavelength)

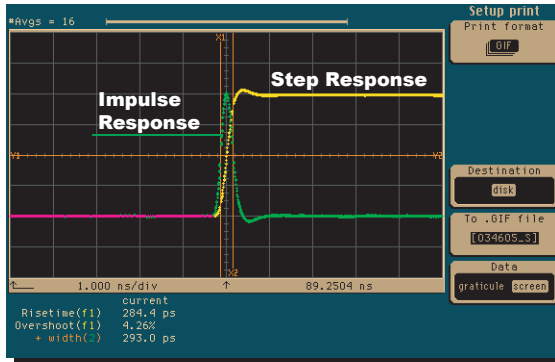


We recommend SPD-3, SPD-4, SPA-3 or SPA-4 for multi-wavelength use. Frequency response of these models do not depend on wavelength.

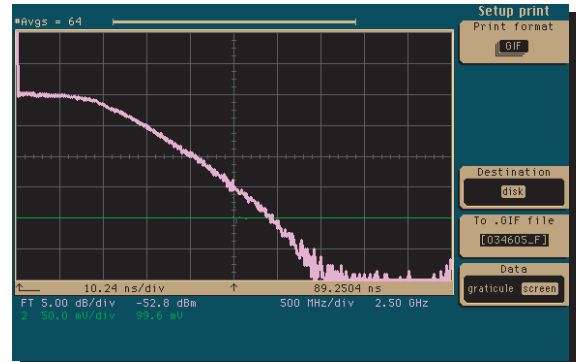
# ● Characteristics of SPD series

## SPD-1

DC ~ 1.2GHz  
 Max. Core Dia.  
 =  $\phi 0.8$   
 Max. NA = 0.2  
 Conversion Gain  
 = 500mV/mW



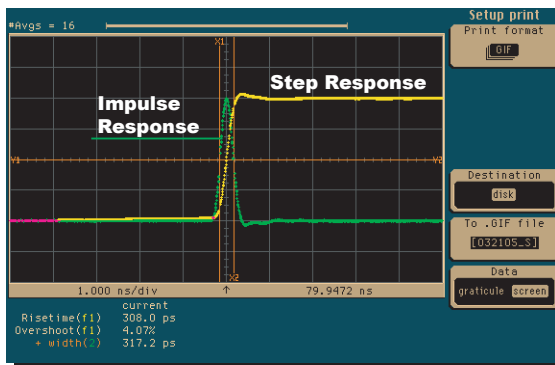
Impulse & Step Response of SPD-1



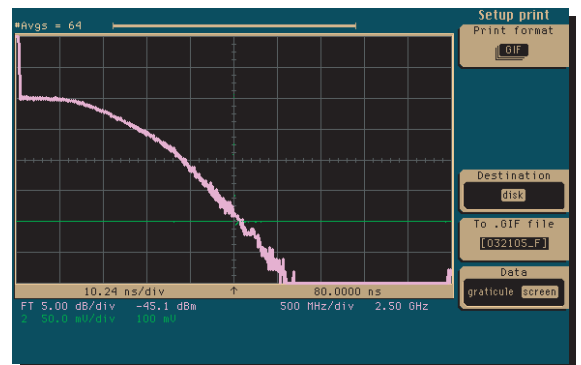
Frequency response of SPD-1

## SPD-2

DC ~ 1.2GHz  
 Max. Core Dia.  
 =  $\phi 1.0$   
 Max. NA = 0.25  
 Conversion Gain  
 = 1000mV/mW



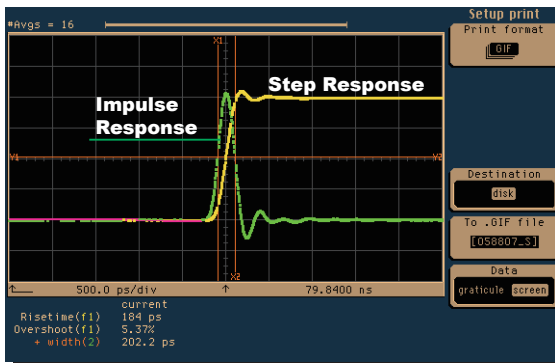
Impulse & Step Response of SPD-2



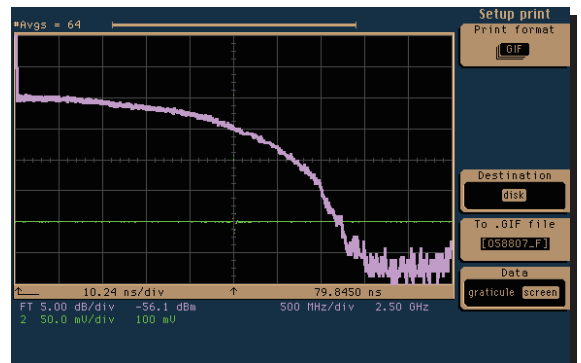
Frequency response of SPD-2

## SPD-3

DC ~ 2GHz  
 Max. Core Dia.  
 =  $\phi 0.5$   
 Max. NA = 0.25  
 Conversion Gain  
 = 500mV/mW



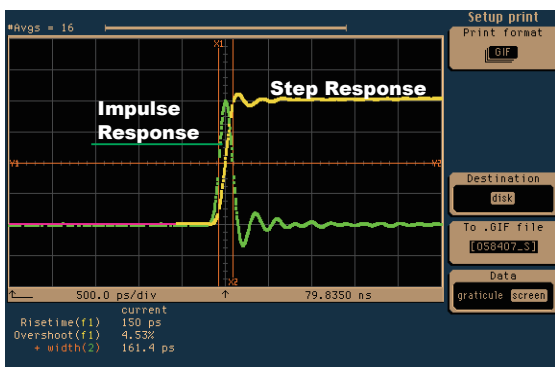
Impulse & Step Response of SPD-3



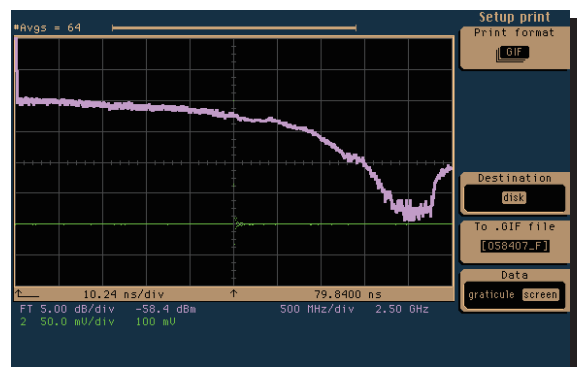
Frequency response of SPD-3

## SPD-4

DC ~ 3GHz  
 Max. Core Dia.  
 =  $\phi 0.5$   
 Max. NA = 0.25  
 Conversion Gain  
 = 300mV/mW



Impulse & Step Response of SPD-4

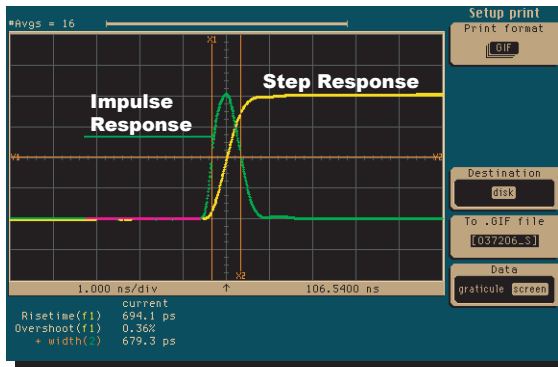


Frequency response of SPD-4

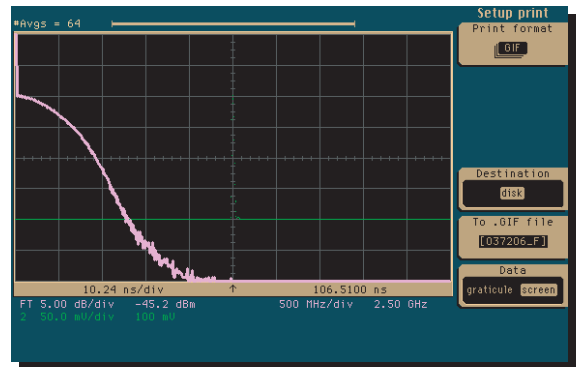
(Step Response & Frequency Response are calculated from Impulse Response.)

# ● Characteristics of SPA series

**SPA-1**  
 DC ~ 500MHz  
 Max. Core Dia.  
 =  $\phi$  1.0  
 Max. NA = 0.5  
 Conversion Gain  
 = 500mV/mW

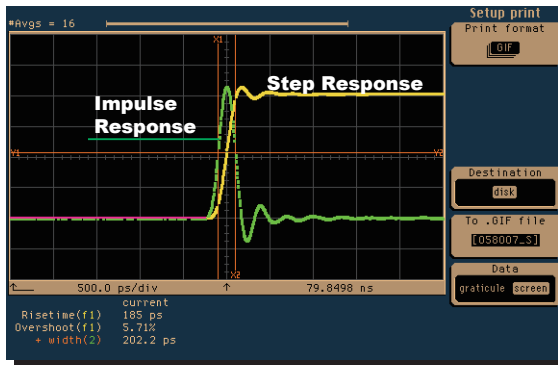


Impulse & Step Response of SPA-1

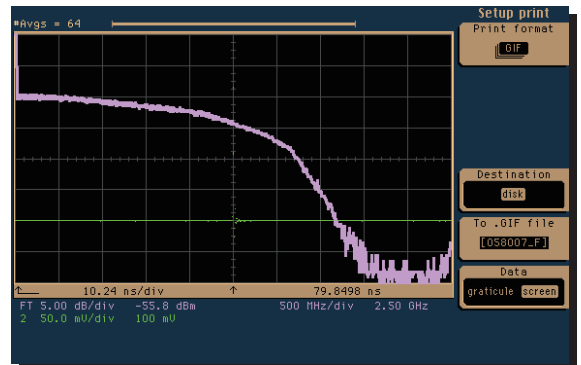


Frequency response of SPA-1

**SPA-3**  
 DC ~ 2GHz  
 Max. Core Dia.  
 =  $\phi$  0.25  
 Max. NA = 0.5  
 Conversion Gain  
 = 500mV/mW

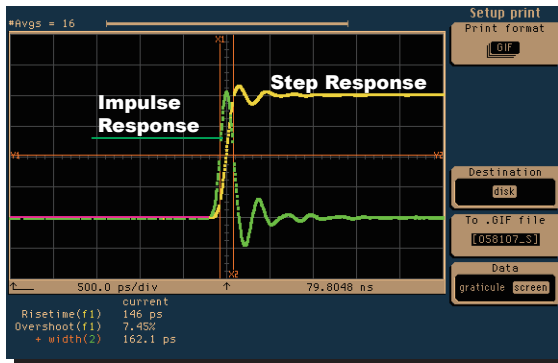


Impulse & Step Response of SPA-3

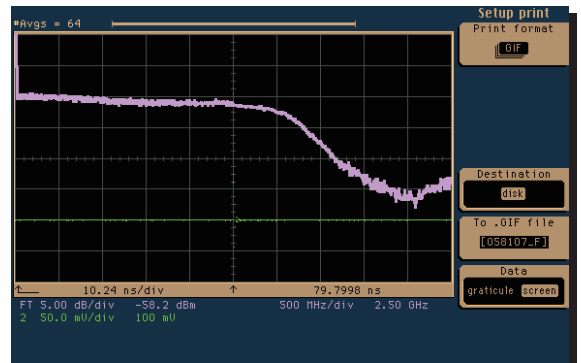


Frequency response of SPA-3

**SPA-4**  
 DC ~ 3GHz  
 Max. Core Dia.  
 =  $\phi$  0.25  
 Max. NA = 0.5  
 Conversion Gain  
 = 300mV/mW

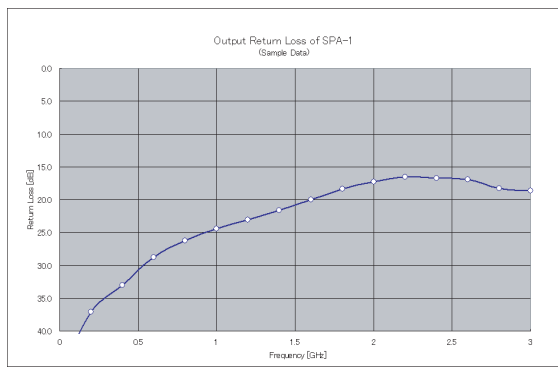


Impulse & Step Response of SPA-4

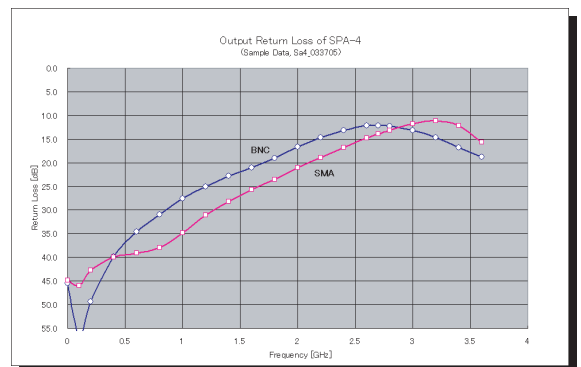


Frequency response of SPA-4

**Output Return Loss of SPA-1 & SPA-4**



Output Return Loss of SPA-1



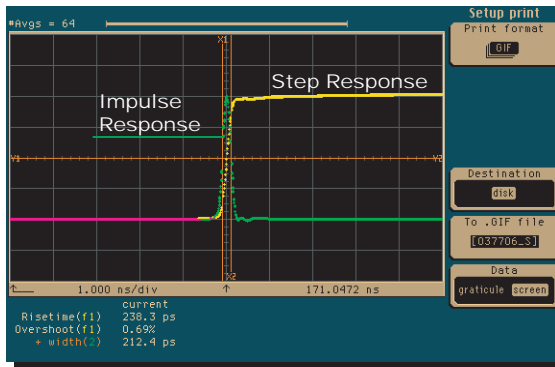
Output Return Loss of SPA-4

(Step Response & Frequency Response are calculated from Impulse Response.)

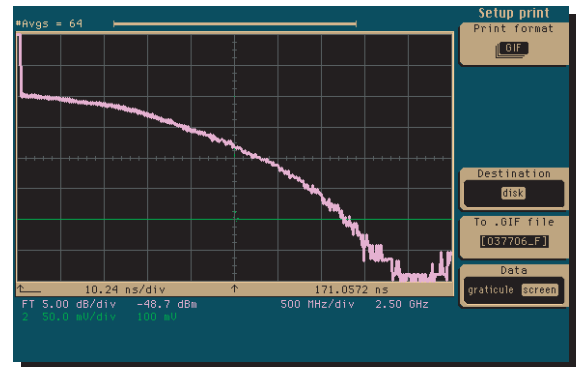
# ● Characteristics of LPD series

## LPD-1

DC ~ 1.5GHz  
 Max. Core Dia.  
 =  $\phi$  0.08  
 Max. NA = 0.2  
 Conversion Gain  
 = 500mV/mW



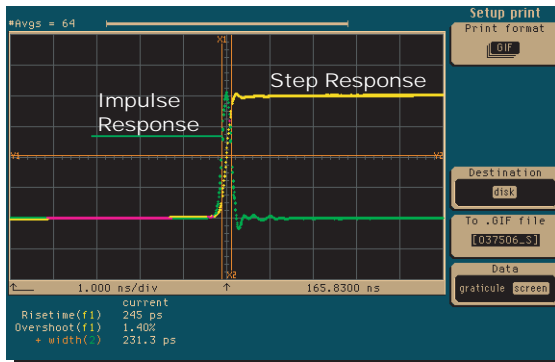
Impulse & Step Response of LPD-1



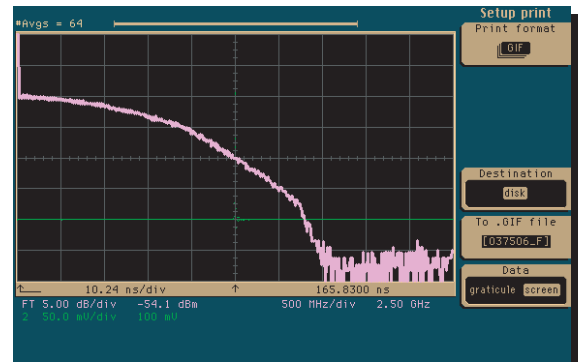
Frequency response of LPD-1

## LPD-2

DC ~ 1.5GHz  
 Max. Core Dia.  
 =  $\phi$  0.5  
 Max. NA = 0.25  
 Conversion Gain  
 = 1000mV/mW



Impulse & Step Response of LPD-2



Frequency response of LPD-2

(Step Response & Frequency Response are calculated from Impulse Response.)

## CAUTION

### ①SPD-1 & SPD-2

Typical SPD-1 and SPD-2 are tuned for 850nm of wavelength. We have also 650nm version of these models. Please check the wavelength under test and the product version to prevent frequency response error around 1MHz to 100MHz. This response error is caused by wavelength dependency of the frequency response of the PD device used in SPD-1 and SPD-2.

We highly recommend SPD-3, SPD-4, SPA-3, or SPA-4 for multi-wavelength use. Frequency response of these models do not depend on wavelength.

### ②SPA-1

Minimum fiber core diameter for SPA-1 is 100um to prevent frequency response error over 1MHz. This response error is caused by too much optical power density on the PD device inside SPA-1. Typical SPA-1 is tuned for 650nm of wavelength. The PD device used in SPA-1 also has wavelength dependency of the frequency response. Please check the wavelength you intend to observe.

# ● Specifications of OE Converters

## ■ SPD series

Item	SPD-1 650 & SPD-1 850	SPD-2 650 & SPD-2 850	SPD-3	SPD-4
Acceptable Core Diameter	Less than 800 $\mu\text{m}$	Less than 1000 $\mu\text{m}$	Less than 500 $\mu\text{m}$	Less than 500 $\mu\text{m}$
Acceptable Fiber NA	Less than 0.2	Less than 0.25	Less than 0.25	Less than 0.25
OE Device	Si PIN PD	Si PIN PD	Si PIN PD	Si PIN PD
Active Area	$\Phi 0.4\text{mm}$	$\Phi 0.4\text{mm}$	$\Phi 0.2\text{mm}$	$\Phi 0.2\text{mm}$
Peak Sensitivity Wavelength	760nm	760nm	700nm	700nm
Wavelength Range	320~1000nm (Test Condition: More than 1/5 of Peak Sensitivity)	380~1000nm (Test Condition: More than 1/5 of Peak Sensitivity)	380~950nm (Test Condition: More than 1/5 of Peak Sensitivity)	380~950nm (Test Condition: More than 1/5 of Peak Sensitivity)
Conversion Gain	500mV/mW @650nm 500mV/mW @850nm	1000mV/mW @650nm 1000mV/mW @850nm	500mV/mW @850nm	300mV/mW @850nm
Maximum Optical Power for Proper Signal Output	-1dBm @650nm -1dBm @850nm	-4dBm @650nm -4dBm @850nm	-1dBm @850nm	+1dBm @850nm
Frequency Bandwidth	DC ~ 1.2GHz	DC ~ 1.2GHz	DC ~ 2.0GHz	DC ~ 3.0GHz
Noise Equivalent Power	Less than -26.0dBm	Less than -27.3dBm	Less than -25.2dBm	Less than -22.4dBm
Response deviation	Electrically +0.5dB, -3.0dB Optically +0.25dB, -1.5dB	Electrically +0.5dB, -3.0dB Optically +0.25dB, -1.5dB	Electrically +0.5dB, -3.0dB Optically +0.25dB, -1.5dB	Electrically +0.5dB, -3.0dB Optically +0.25dB, -1.5dB
Output Coax Connector	BNC Plug, Option : SMA	BNC Plug, Option : SMA	BNC Plug, Option : SMA	BNC Plug, Option : SMA
Output Impedance	50 $\Omega$	50 $\Omega$	50 $\Omega$	50 $\Omega$
Output Offset Voltage	Within $\pm 0.5\text{mV}$	Within $\pm 0.5\text{mV}$	Within $\pm 0.5\text{mV}$	Within $\pm 0.5\text{mV}$
Wideband Noise Voltage	Less than 1.3mVrms (UP to 12.4GHz)	Less than 1.9mVrms (UP to 12.4GHz)	Less than 1.5mVrms (UP to 12.4GHz)	Less than 1.8mVrms (UP to 12.4GHz)
Input Optical Connector	FC Receptacle Option : SC, ST, F05, FSMA are also available	FC Receptacle Option : SC, ST, F05, FSMA are also available	FC Receptacle Option : SC, ST, F05, FSMA are also available	FC Receptacle Option : SC, ST, F05, FSMA are also available
Power Input Connector	LEMO OS-4P	LEMO OS-4P	LEMO OS-4P	LEMO OS-4P
Supply Voltage	DC $\pm 15\text{V}$ (Max +150mA/-50mA)	DC $\pm 15\text{V}$ (Max +150mA/-50mA)	DC $\pm 15\text{V}$ (Max +150mA/-50mA)	DC $\pm 15\text{V}$ (Max +150mA/-50mA)
Physical Dimension	93 x 44 x 21mm	103 x 44 x 21mm	103 x 44 x 21mm	103 x 44 x 21mm
Weight	110g	130g	130g	130g

## ■ SPA series & LPD series

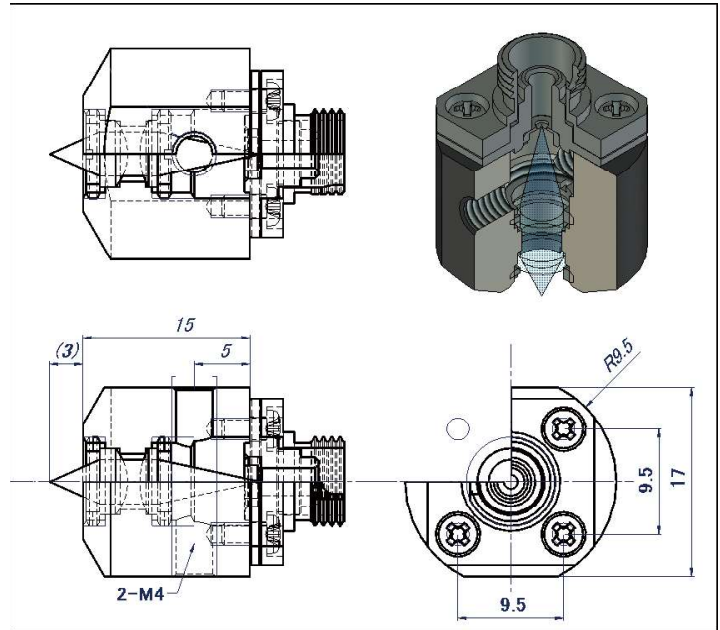
Item	SPA-1	SPA-3	SPA-4	LPD-1	LPD-2
Acceptable Core Diameter	100 $\mu\text{m}$ ~1000 $\mu\text{m}$	Less than 250 $\mu\text{m}$	Less than 250 $\mu\text{m}$	Less than 80 $\mu\text{m}$	Less than 500 $\mu\text{m}$
Acceptable Fiber NA	Less than 0.5	Less than 0.5	Less than 0.5	Less than 0.2	Less than 0.25
OE Device	Si PIN PD	Si PIN PD	Si PIN PD	InGaAs PIN PD	InGaAs PIN PD
Active Area	$\Phi 0.8\text{mm}$	$\Phi 0.2\text{mm}$	$\Phi 0.2\text{mm}$	$\Phi 0.08\text{mm}$	$\Phi 0.2\text{mm}$
Peak Sensitivity Wavelength	800nm	700nm	700nm	1550nm	1550nm
Wavelength Range	400~1000nm (Test Condition: More than 1/5 of Peak Sensitivity)	380~950nm (Test Condition: More than 1/5 of Peak Sensitivity)	380~950nm (Test Condition: More than 1/5 of Peak Sensitivity)	900~1650nm (Test Condition: More than 1/5 of Peak Sensitivity)	950~1650nm (Test Condition: More than 1/5 of Peak Sensitivity)
Conversion Gain	500mV/mW @650nm	500mV/mW @850nm	300mV/mW @850nm	500mV/mW @1300nm	1000mV/mW @1300nm
Maximum Optical Power for Proper Signal Output	-1dBm @650nm	-1dBm @850nm	+1dBm @850nm	-1dBm @1300nm	-4dBm @1300nm
Frequency Bandwidth	DC ~ 500MHz	DC ~ 2.0GHz	DC ~ 3.0GHz	DC ~ 1.5GHz	DC ~ 1.5GHz
Noise Equivalent Power	Less than -27.9dBm	Less than -25.2dBm	Less than -22.4dBm	Less than -27.9dBm	Less than -29.2dBm
Response deviation	Electrically +0.5dB, -3.0dB Optically +0.25dB, -1.5dB	Electrically +0.5dB, -3.0dB Optically +0.25dB, -1.5dB	Electrically +0.5dB, -3.0dB Optically +0.25dB, -1.5dB	Electrically +0.5dB, -3.0dB Optically +0.25dB, -1.5dB	Electrically +0.5dB, -3.0dB Optically +0.25dB, -1.5dB
Output Coax Connector	BNC Plug, Option : SMA	BNC Plug, Option : SMA	BNC Plug, Option : SMA	BNC Plug, Option : SMA	BNC Plug, Option : SMA
Output Impedance	50 $\Omega$	50 $\Omega$	50 $\Omega$	50 $\Omega$	50 $\Omega$
Output Offset Voltage	Within $\pm 0.5\text{mV}$	Within $\pm 0.5\text{mV}$	Within $\pm 0.5\text{mV}$	Within $\pm 0.5\text{mV}$	Within $\pm 0.5\text{mV}$
Wideband Noise Voltage	Less than 0.8mVrms (UP to 12.4GHz)	Less than 1.5mVrms (UP to 12.4GHz)	Less than 1.8mVrms (UP to 12.4GHz)	Less than 0.8mVrms (UP to 12.4GHz)	Less than 1.8mVrms (UP to 12.4GHz)
Input Optical Connector	FC Receptacle Option : SC, ST, F05, FSMA are also available	FC Receptacle Option : SC, ST, F05, FSMA are also available	FC Receptacle Option : SC, ST, F05, FSMA are also available	FC Receptacle Option : SC, ST, F05, FSMA are also available	FC Receptacle Option : SC, ST, F05, FSMA are also available
Power Input Connector	LEMO OS-4P	LEMO OS-4P	LEMO OS-4P	LEMO OS-4P	LEMO OS-4P
Supply Voltage	DC $\pm 15\text{V}$ (Max +150mA/-50mA)	DC $\pm 15\text{V}$ (Max +150mA/-50mA)	DC $\pm 15\text{V}$ (Max +150mA/-50mA)	DC $\pm 15\text{V}$ (Max +150mA/-50mA)	DC $\pm 15\text{V}$ (Max +150mA/-50mA)
Physical Dimension	103 x 44 x 21mm	103 x 44 x 21mm	103 x 44 x 21mm	93 x 44 x 21mm	103 x 44 x 21mm
Weight	130g	130g	130g	110g	130g

## ●GC-3420

- GC-3420 is a tiny optical fiber coupler. Get higher optical coupling efficiency between the optical pick-up and the fiber using GC-3420.
- Just attach a GC-3420 to end of the optical fiber and set it above the objective lens of the pick-up. Input NA of GC-3420 is 0.34 and fiber side NA is 0.2, GC-3420 is also available for high NA objective Pick-up.
- Small size and light weight. It can be easily installed even in narrow space. M4 screw hole will be convenient for installation.
- Typical GC-3420 has a FC type optical receptacle. SC type connector is optional.

### Specifications

Item	Condition	Value	Remarks
Coupling Efficiency	From NA = 0.65 Lens	32.7%	Measured Value
	From NA = 0.85 Lens	Approx. 10%	Calculated Value
NA of GC-3420	Pick-up side	0.34	
	Receptacle side	0.2	
Optical Connector	- - -	FC Receptacle	SC is optional
Wavelength	- - -	400~1000nm	
Weight	- - -	16g	
Physical Dimension	- - -	Refer to the figure on the right	



## ●Corporate Profile

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FAX : +81-4-2966-0817
- Established         November 2nd, 1992
- Webpage            [https://www.graviton.co.jp/index\\_En.html](https://www.graviton.co.jp/index_En.html)
- E-mail              info@graviton.co.jp

**Graviton Incorporated**