Ultrafast Photodetectors

UPD Series

NEW MODELS:
Faster Rise Times & Wider Wavelength Ranges



The UPD series of ultrafast photodetectors are best suited for measurement of optical waveforms from DC to 25 GHz. Various models feature rise times as short as **15 ps** and cover the spectral range from **170 to 2600 nm**.

All photodetectors are enclosed in compact and solid aluminum housings and can be biased with a battery or an external power supply.

The UV-extended versions of the silicon type photodetectors are the only commercial products that cover the spectral range from 170 to 1100 nm.

Another type of unique UV-sensitive InGaAs photodetectors can be used for detecting laser pulses in the range from 350 to 1700 nm, thus having the widest spectral range and the highest speed commercially available.

Perfect impedance matching and state-of-the-art microwave technology assure pulse form measurements without any ringing or artefacts. The customer is free to use a 50 Ω terminating resistor for highest speed operation, or a high impedance load for obtaining large signals. This guarantees maximum flexibility for diverse applications.

In combination with our BBA series of wideband high-gain amplifiers, the high-speed photodetectors are an advantageous alternative to the expensive and cumbersome avalanche photodiodes.

The UPD series high-speed photodetectors are indispensable tools for laser and photonics research.

Features

- Ultra High-Speed Operation
- Rise Times: **starting from 15 ps**
- Bandwidths: **up to 25 GHz**
- Spectral Ranges: **170 - 2600 nm**
- Compact Design
- Battery or External Power Supply
- Models for Free-Space Beam, or with FC/PC Receptacle or Pigtailed with SM Fiber

Applications

- Pulse Form Measurements
- Pulse Duration Measurements
- Precise Synchronization
- Mode Beating Monitoring
- Heterodyne Measurements

New Models Available: Faster Rise Times & Wider Wavelength Ranges

- **UPD-15-IR2-FC**: Ultrafast InGaAs PIN photodetector, rise time < 15 ps, bandwidth > 25 GHz, spectral range 800 - 1700 nm, fiber-coupled input with FC/APC connector
- **UPD-35-IR2-P**, **UPD-35-IR2-D**: Ultrafast InGaAs PIN photodetectors, rise time < 35 ps, bandwidth > 10 GHz, spectral range 800 - 1700 nm, with polished or diffuse window
- **UPD-35-UVIR-P**, **UPD-35-UVIR-D**: Ultrafast InGaAs PIN photodetectors, rise time < 35 ps, bandwidth > 10 GHz, spectral range 350 - 1700 nm, with polished or diffuse window
- **UPD-50-SP**, **UPD-50-SD**, **UPD-50-UD**, **UPD-50-UP**: Ultrafast Si PIN photodetectors, rise time 50 ps, fall time 50 ps, bandwidth > 7 GHz, spectral range 170 - 1100 nm or 320 - 1100 nm, with polished or diffuse window
- **UPD-100-IR1-P**: Ultrafast Ge photodetector, rise time < 100 ps, pulsewidth (FWHM) 300 ps, spectral range 400 - 2000 nm
- **UPD-3N-IR2-P**: Fast InGaAs photodetector, extended infrared range up to 2.1 µm, rise time 150 ps
- **UPD-5N-IR2-P**: Fast InGaAs photodetector, extended infrared range up to 2.6 µm, rise time 200 ps

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UPD Series • Available Models

Model	Rise Time (ps)	Band-width (GHz)	Spectral Range (nm)	Quantum Efficiency @ Peak	Sensitive Area (Dia. µm / mm²)	Noise Equiv. Power (W/√Hz)	Dark Current (nA)	Material	Optical Input / Window Type [1]	RF Output Connec-tor Type
UPD-15-IR2-FC	< 15	> 25	800 - 1700	75%	Fiber, 9 µm	1.0×10^{-15}	0.1	InGaAs	Fiber w. FC/APC [5]	SMA
UPD-30-VSG-P	< 30	> 10	320 - 900	40%	200×200 / 0.04	3.0×10^{-15}	0.1	GaAs	Polished, glass	SMA
UPD-35-IR2-P	< 35	> 10	800 -1700	80%	55 / 0.0024	1.0×10^{-15}	0.3	InGaAs	Polished, glass	SMA
UPD-35-IR2-D	< 35	> 10	800 -1700	80%	55 / 0.0024	1.0×10^{-15}	0.3	InGaAs	Diffuse, quartz	SMA
UPD-35-IR2-FR	< 35	> 10	800 -1700	80%	55 / 0.0024	1.0×10^{-15}	0.3	InGaAs	FC/PC receptacle [5]	SMA
UPD-35-IR2-FC	< 35	> 10	800 -1700	80%	Fiber, 9 µm	1.0×10^{-15}	0.3	InGaAs	Fiber w. FC/APC [5]	SMA
UPD-35-UVIR-P	< 35	> 10	**350 -1700**	80%	55 / 0.0024	1.0×10^{-15}	0.3	InGaAs [4]	Polished, MgF_2	SMA
UPD-35-UVIR-D	< 35	> 10	**350 -1700**	80%	55 / 0.0024	1.0×10^{-15}	0.3	InGaAs [4]	Diffuse, quartz	SMA
UPD-40-VSI-P	< 40	> 8.5	500 - 1690	40%	200×200 / 0.04	3.0×10^{-10}	5000	InGaAs	Polished, glass	SMA
UPD-40-IR2-P	< 40	> 8.5	800 - 1700	80%	60 / 0.0028	1.1×10^{-15}	0.5	InGaAs	Polished, glass	SMA
UPD-40-IR2-D	< 40	> 8.5	800 - 1700	80%	60 / 0.0028	1.1×10^{-15}	0.5	InGaAs	Diffuse, quartz	SMA
UPD-40-IR2-FR	< 40	> 8.5	800 - 1700	80%	60 / 0.0028	1.1×10^{-15}	0.5	InGaAs	FC/PC receptacle [5]	SMA
UPD-40-IR2-FC	< 40	> 8.5	800 - 1700	80%	Fiber, 9 µm	1.1×10^{-15}	0.5	InGaAs	Fiber w. FC/APC [5]	SMA
UPD-40-UVIR-P	< 40	> 8.5	**350 - 1700**	80%	60 / 0.0028	1.1×10^{-15}	0.5	InGaAs [4]	Polished, MgF_2	SMA
UPD-40-UVIR-D	< 40	> 8.5	**350 - 1700**	80%	60 / 0.0028	1.1×10^{-15}	0.5	InGaAs [4]	Diffuse, quartz	SMA
UPD-50-SP	< 50	> 7.0	320 - 1100	45%	100 / 0.0079	1.2×10^{-15}	0.001	Si	Polished, glass	SMA
UPD-50-SD	< 50	> 7.0	320 - 1100	45%	100 / 0.0079	1.2×10^{-15}	0.001	Si	Diffuse, quartz	SMA
UPD-50-UP	< 50	> 7.0	**170 - 1100**	45%	100 / 0.0079	1.2×10^{-15}	0.001	Si [4]	Polished, MgF_2	SMA
UPD-50-UD	< 50	> 7.0	**170 - 1100**	45%	100 / 0.0079	1.2×10^{-15}	0.001	Si [4]	Diffuse, quartz	SMA
UPD-70-IR2-P	< 70	> 5.0	800 - 1700	80%	80 / 0.005	2.0×10^{-15}	0.8	InGaAs	Polished, glass	SMA
UPD-70-IR2-D	< 70	> 5.0	800 - 1700	80%	80 / 0.005	2.0×10^{-15}	0.8	InGaAs	Diffuse, quartz	SMA
UPD-70-IR2-FR	< 70	> 5.0	800 - 1700	80%	80 / 0.005	2.0×10^{-15}	0.8	InGaAs	FC/PC receptacle [5]	SMA
UPD-70-IR2-FC	< 70	> 5.0	800 - 1700	80%	Fiber, 9 µm	2.0×10^{-15}	0.8	InGaAs	Fiber w. FC/APC [5]	SMA
UPD-70-UVIR-P	< 70	> 5.0	**350 - 1700**	80%	80 / 0.005	2.0×10^{-15}	0.8	InGaAs [4]	Polished, MgF_2	SMA
UPD-70-UVIR-D	< 70	> 5.0	**350 - 1700**	80%	80 / 0.005	2.0×10^{-15}	0.8	InGaAs [4]	Diffuse, quartz	SMA
UPD-100-IR1-P [2]	< 100	> 3.0	**400 - 2000**	80%	80 / 0.005	3.0×10^{-13}	700	Ge	Polished, glass	SMA
UPD-200-SP	< 175	> 2.0	320 - 1100	85%	400 / 0.126	1.5×10^{-15}	0.001	Si	Polished, glass	BNC
UPD-200-SD	< 175	> 2.0	320 - 1100	85%	400 / 0.126	1.5×10^{-15}	0.001	Si	Diffuse, quartz	BNC
UPD-200-UP	< 175	> 2.0	**170 - 1100**	85%	400 / 0.126	1.5×10^{-15}	0.001	Si [4]	Polished, MgF_2	BNC
UPD-200-UD	< 175	> 2.0	**170 - 1100**	85%	400 / 0.126	1.5×10^{-15}	0.001	Si [4]	Diffuse, quartz	BNC
UPD-300-SP	< 300	> 1.0	320 - 1100	90%	600 / 0.283	3.0×10^{-15}	0.01	Si	Polished, glass	BNC
UPD-300-SD	< 300	> 1.0	320 - 1100	90%	600 / 0.283	3.0×10^{-15}	0.01	Si	Diffuse, quartz	BNC
UPD-300-UP	< 300	> 1.0	**170 - 1100**	90%	600 / 0.283	3.0×10^{-15}	0.01	Si [4]	Polished, MgF_2	BNC
UPD-300-UD	< 300	> 1.0	**170 - 1100**	90%	600 / 0.283	3.0×10^{-15}	0.01	Si [4]	Diffuse, quartz	BNC
UPD-500-SP	< 500	> 0.6	320 - 1100	90%	800 / 0.5	3.5×10^{-15}	0.01	Si	Polished, glass	BNC
UPD-500-SD	< 500	> 0.6	320 - 1100	90%	800 / 0.5	3.5×10^{-15}	0.01	Si	Diffuse, quartz	BNC
UPD-500-UP	< 500	> 0.6	**170 - 1100**	90%	800 / 0.5	3.5×10^{-15}	0.01	Si [4]	Polished, MgF_2	BNC
UPD-500-UD	< 500	> 0.6	**170 - 1100**	90%	800 / 0.5	3.5×10^{-15}	0.01	Si [4]	Diffuse, quartz	BNC
UPD-3N-IR2-P	< 150 [6]	> 0.4 [6]	**800 - 2100**	75%	300 / 0.07	1.5×10^{-13}	90	InGaAs	Polished, glass	BNC
UPD-5N-IR2-P	< 200 [6]	> 0.3 [6]	**800 - 2600**	70%	300 / 0.07	7.0×10^{-13}	2000	InGaAs	Polished, glass	BNC
UPD-2M-IR2-P	< 75000	> 0.004	**900 - 1700**	80%	2000 / 3.14	4.0×10^{-14}	5	InGaAs	Polished, glass	BNC
UPD-2M-IR2-P-1TEC [3]	< 75000	> 0.004	**900 - 1700**	75%	2000 / 3.14	1.0×10^{-14}	0.3	InGaAs	Polished, glass	BNC

Notes: [1] *The diffuse window reduces the positioning accuracy requirements and increases the damage threshold at the cost of a reduced sensitivity by a factor of approx. three to five.* ***Recommended for high peak power lasers only.***

[2] *This model has negative output. All other models have positive output by default but may be ordered with negative output if required.*

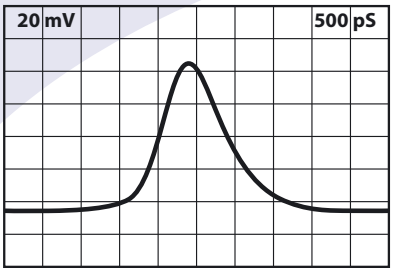
[3] *With TEC cooling module, non-standard housing.*

[4] *Modified material with increased blue / UV sensitivity.*

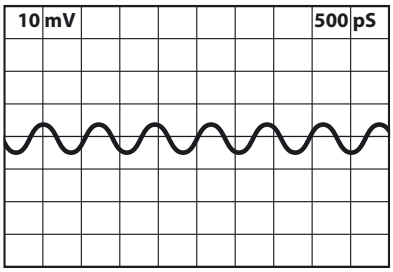
[5] *Not compatible with the optional filter holder.*

[6] *Greatly improved performance.*

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High fidelity pulse form measurement with UPD-200-SP and 1 GHz oscilloscope. The light source is our PULSELAS®-P-1064-100 subnanosecond Q-switched laser.



Longitudinal mode beating of a He-Ne laser (633 nm) recorded with UPD-200-SP photodetector and 1 GHz oscilloscope. The modulation depth of the 1.5 GHz beating signal is limited to 25% by the oscilloscope bandwidth.

Power Sources for UPD Series
(depend on the photodetector model)

Low-Noise Power Supply
European Standard
Input: 230 V AC
Output: 12 V DC
Model: **PS-UPD-12-EU**

Low-Noise Power Supplies
Worldwide Usage
Input: 100 - 240 V AC

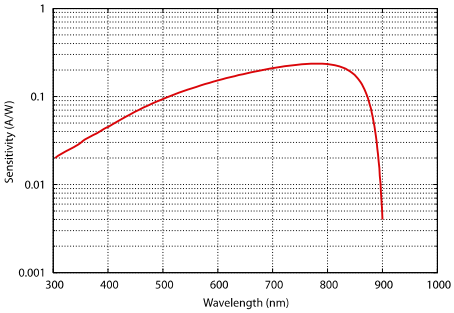
Output: 6 V DC
Model: **PS-UPD-6-WW**

Output: 9 V DC
Model: **PS-UPD-9-WW**

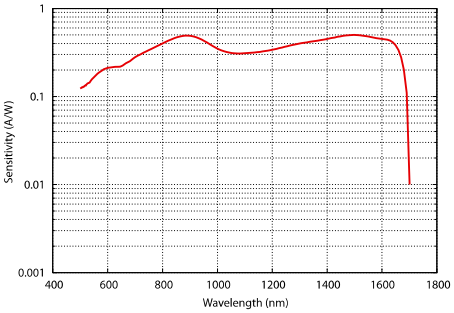
Output: 12 V DC
Model: **PS-UPD-12-WW**

Bias Battery
6 V
Model: **BAT-UPD-6V**

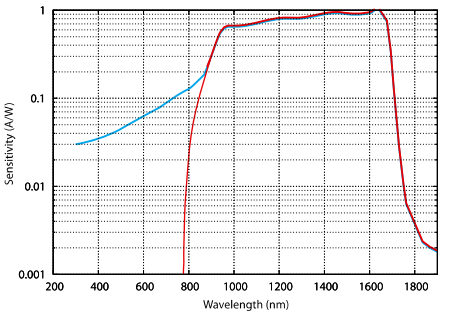
Spectral Response GaAs Schottky
Ultrafast Photodetector
UPD-30-VSG-P



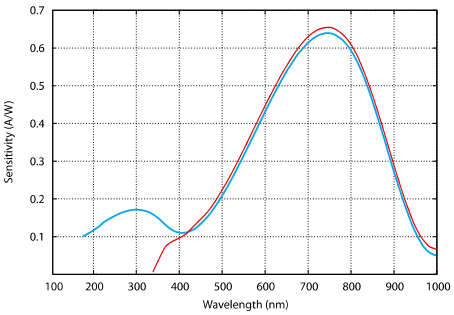
Spectral Response InGaAs Schottky
Ultrafast Photodetector
UPD-40-VSI-P



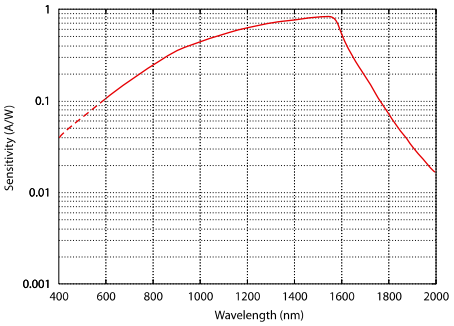
Spectral Response InGaAs
Ultrafast Photodetectors
UPD-35-IR2-P, UPD-40-IR2-P, UPD-70-IR2-P
UPD-35-UVIR-P, UPD-40-UVIR-P, UPD-70-UVIR-P



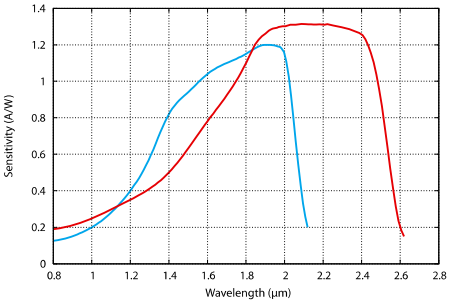
Spectral Response Si PIN
Ultrafast Photodetectors
UPD-50-SP, UPD-200-SP, UPD-300-SP, UPD-500-SP
UPD-50-UP, UPD-200-UP, UPD-300-UP, UPD-500-UP



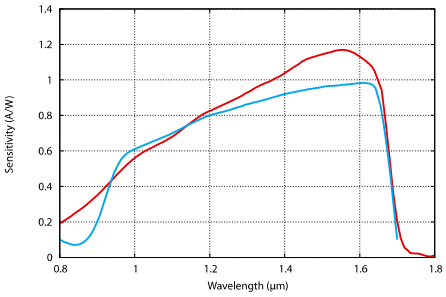
Spectral Response Ge pn
Ultrafast Photodetectors
UPD-100-IR1-P



Spectral Response InGaAs PIN
Ultrafast Photodetectors
UPD-3N-IR2-P
UPD-5N-IR2-P



Spectral Response InGaAs PIN
Ultrafast Photodetectors
UPD-2M-IR2-P
UPD-2M-IR2-P-1TEC



Important notice: The sensitivity curves are for reference only and are not recommended to be used for calibration or amplitude measurement purposes.

Related Products

- Broadband Amplifiers BBA Series (amplitude gain: ×10, ×100 or variable ×1÷100)
- BNC 50 Ω Terminating Load
- SMA (male) to BNC (female) Adapter
- SMA to SMA Adapter
- Attenuator Filter Adapter

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