Opto-Electronic Components

YOUR PARTNER

High Breakdown Voltage, Fully Depleted Series

Large Active Area Photodiodes

Features

High Speed Detectors

- Large Active Area
- Fully Depletable
- Fast Response
- Ultra Low Dark Current
- Low Capacitance

Radiation Detectors

- Large Active Area
- Scintillator Mountable
- Fully Depletable
- Ultra Low Dark Current
- Low Capacitance
- High Breakdown Voltage

Applications

High Speed Detectors

- Laser Guided Missiles
- Laser Warning
- Laser Range Finder
- Laser Alignment
- Control Systems

Radiation Detectors

- Electron Detection
- Medical Instrumentation
- High Energy Spectroscopy
- Charged Particle Detection
- High Energy Physics
- Nuclear Physics

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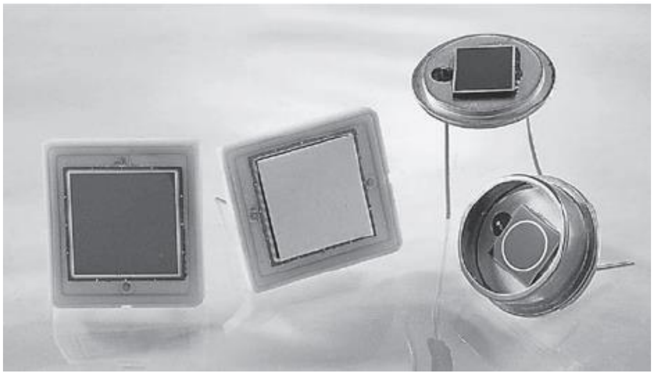

The Large Active Area High Speed Detectors can be fully depleted to achieve the lowest possible junction capacitance for fast response times. They may be operated at a higher reverse voltage, up to the maximum allowable value, for achieving even faster response times in nano seconds. The high reverse bias at this point, increases the effective electric field across the junction, hence increasing the charge collection time in the depleted region. Note that this is achieved without the sacrifice for the high responsivity as well as active area.

The Large Active Area Radiation Detectors can also be fully depleted for applications measuring high energy X-rays, γ-rays as well as high energy particles such as electrons, alpha rays and heavy ions. These types of radiation can be measured with two different methods. Indirect and direct.

Indirect High Energy Radiation Measurement

In this method, the detectors are coupled to a scintillator crystal for converting high energy radiation into a detectable visible wavelength. The devices are mounted on a ceramic and covered with a clear layer of an epoxy resin for an excellent optical coupling to the scintillator. This method is widely used in detection of high energy gamma rays and electrons. This is where the X-UV devices fail to measure energies higher than 17.6 keV. The type and size of the scintillator can be selected based on radiation type and magnitude.

Direct High Energy Radiation Measurement

Both PIN-RD100 and PIN-RD100A, can also be used without any epoxy resin or glass window for direct measurement of high energy radiation such as alpha rays and heavy ions. The radiation exhibits loss of energy along a linear line deep into the silicon after incident on the active area.

The amount of loss and the penetration depth is determined by the type and magnitude of the radiation. In order to measure completely the amount of radiation, the depletion layer should be deep enough to cover the whole track from the incident point to the stop point. This requires a high bias application to fully deplete the detector. In spite of the large active area as well as high bias voltage applications, the devices exhibit super low dark currents, low capacitances and low series resistances.

In addition to their use in high energy particle detection, the PIN-RD100 and PIN-RD100A are also excellent choices for detection in the range between 350 to 1100 nm in applications where a large active area and high speed is desired.

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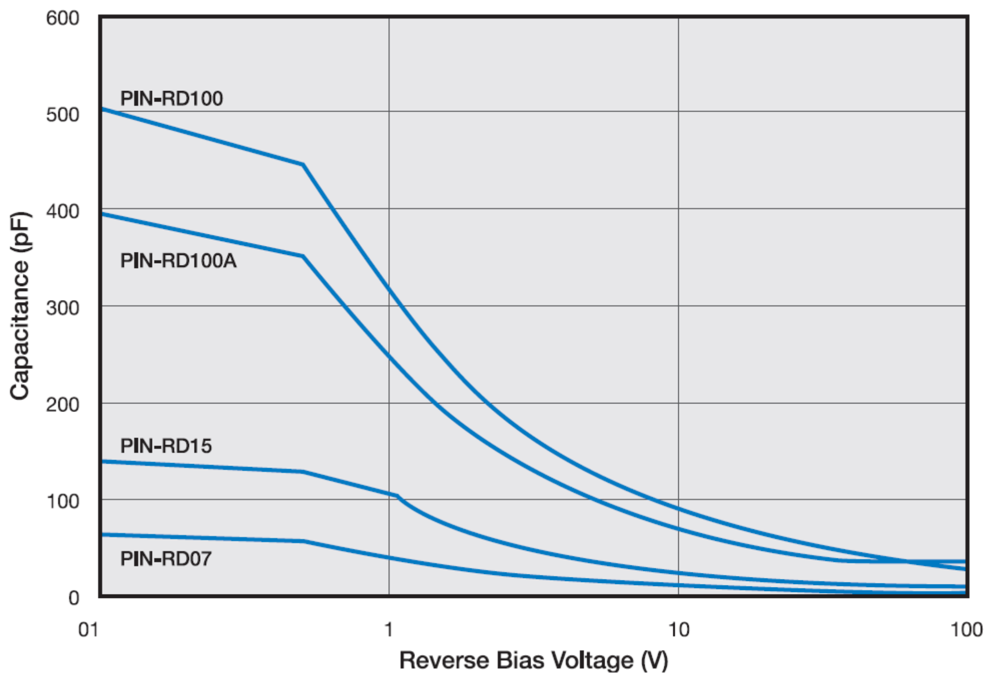
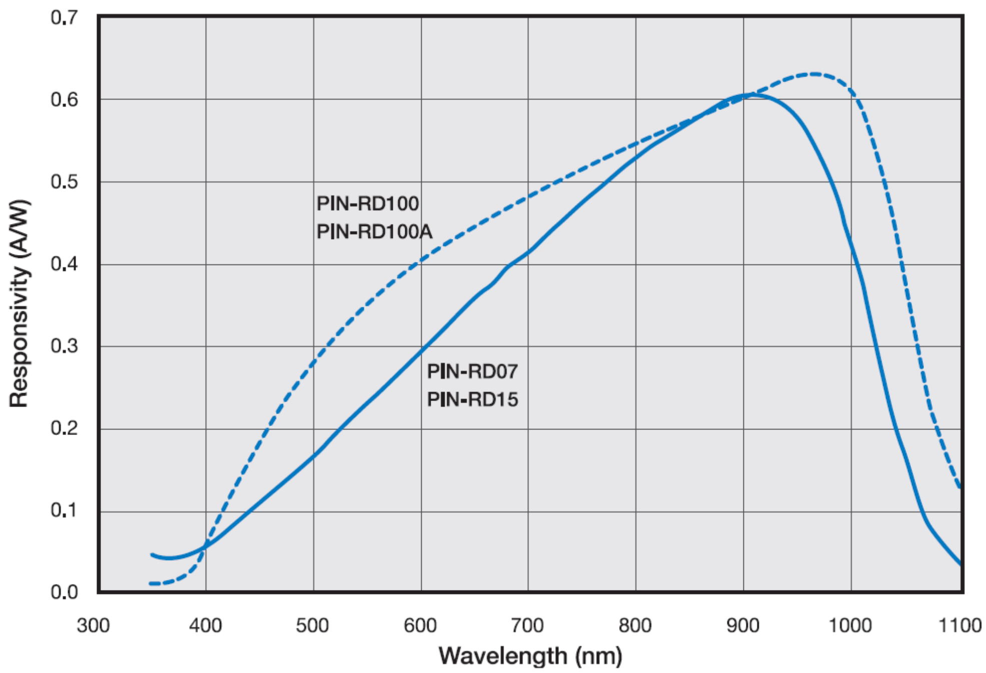
These detectors can be coupled to a charge sensitive preamplifier or low noise op-amp as shown in the opposite page. The configuration for indirect measurement is also shown with a scintillator crystal.

Typical Capacitance vs. Reverse Bias Voltage (T=23°C)



Typical Spectral Response



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TÜV MANAGEMENT SERVICE ISO 9001

Stand 02.07.2018

Typical Electro-Optical Specifications at T_A=23°C

Model Number	Active Area		Peak Responsivity Wavelength (nm)	Responsivity (A/W) 900nm	Depletion Voltage (V)
	Area (mm²)	Dimensions (mm)		Typ	Typ
Large Active Area, High Speed					
PIN-RD07	7.1	3.00 ϕ	900	0.55	48
PIN-RD15	14.9	4.35 ϕ		0.58	55
PIN-RD100	100	10 sq	950	0.60	75
PIN-RD100A	100	10 sq			35

Model Number	Dark Current (nA) -100V		Capacitance (pF) -100V		Rise Time (ns) 900nm, -100V, 50Ω
	Typ	Max	Typ	Max	Typ
Large Active Area, High Speed					
PIN-RD07	0.2	5.0	8.0	9.0	1.5
PIN-RD15	1.0	30	14	16	3.0
PIN-RD100	2 **	10 **	50 **	60 **	---
PIN-RD100A	2	10	40	45	---

Model Number	NEP (W/√Hz) -100V, 900nm	Reverse Voltage (V) 10μA	Temp. Range (°C) *		Package Style
	Typ	Max	Operating	Storage	
Large Active Area, High Speed					
PIN-RD07	1.2 e -14	135	-40 ~ +100	-55 ~ +125	26/ TO-8
PIN-RD15	2.5 e -14	140			
PIN-RD100	3.2 e -14	120	-20 ~ +60	-20 ~ +80	25/ Ceramic
PIN-RD100A	3.4 e -14	70			

Model Number	Active Area		Peak Responsivity Wavelength (nm)	Responsivity (A/W) 900nm	Capacitance (pF) 0V
	Area (mm²)	Dimensions (mm)		Typ	Typ
OSD35-LR-A	34.2	5.8 x 5.9	830	0.54	1300
OSD35-LR-D					

Model Number	Shunt Resistance (GΩ) -10V		NEP (W/√Hz) 900nm	Temp. Range (°C) *		Package Style
	Min	Typ	Typ	Operating	Storage	
OSD35-LR Series						
OSD35-LR-A	2	3	5.6 e -15	-25 ~ +75	-45 ~ +100	25/ Ceramic
OSD35-LR-D	0.1	0.3	1.8 e -14			

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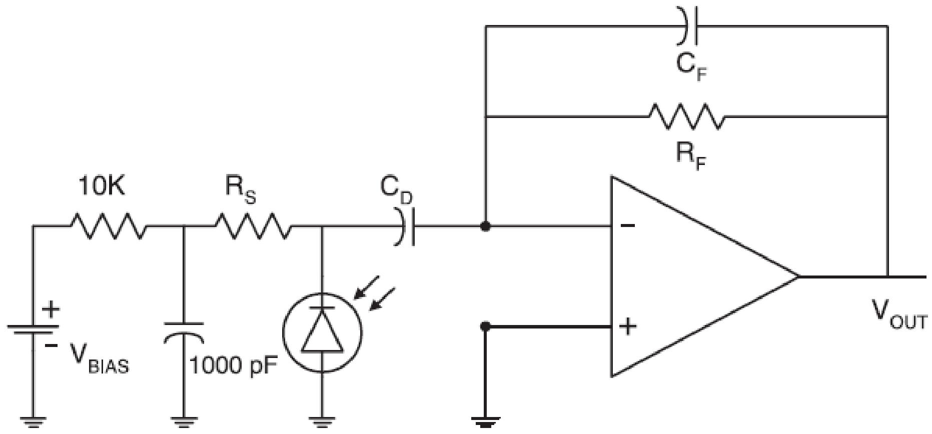
OSD-35-LR's ceramic packages come without window; instead the optically clear epoxy is used.
* Non-condensing temperature and storage range, non-condensing environment.
** Measured at V_{bias} = -50V
For mechanical drawings please refer to "Mechanical Drawings".

Direct Detection

For direct detection of high-energy particles, the pre-amplifier is a FET input op-amp, followed by one or more amplification stages, if necessary, or a commercial charge sensitive preamplifier. The counting efficiency is directly proportional to the incident radiation power. The reverse bias voltage must be selected as such to achieve the best signal-to-noise ratio. For low noise applications, all components should be enclosed in a metal box. Also, the bias supply should be either simple batteries or a very low ripple DC supply. The detector should also be operated in the photovoltaic mode.



Indirect Detection (with scintillator crystal)

The circuit is very similar to the direct detection circuit except that the photodiode is coupled to a scintillator. The scintillator converts the high-energy X-rays and/or X-rays into visible light. Suitable scintillators include CsI(TL), CdWO4, BGO and NaI(TL). The amplifier should be a FET input op-amp, followed by one or more amplification stages, or a commercial charge sensitive preamplifier. The output voltage depends primarily on the scintillator efficiency and should be calibrated by using radioactive sources.

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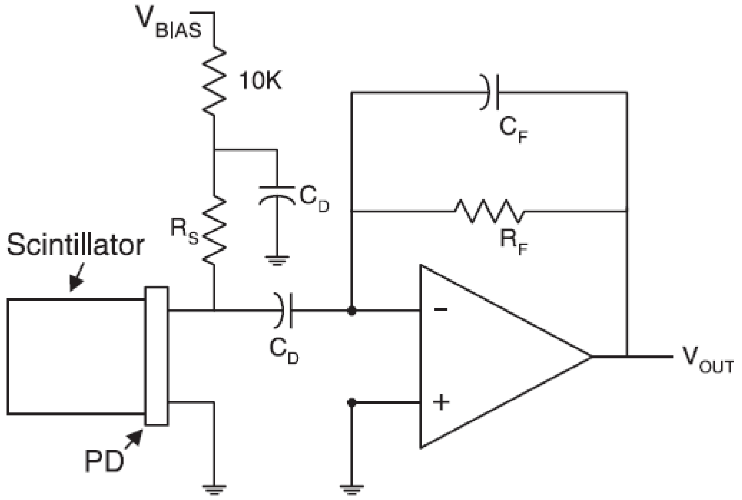

Amplifier: OPA-637, OPA-27 or similar

RF : 10 MΩ to 10 GΩ

RS : 1 MΩ; Smaller for High Counting Rates

CF: 1pF

CD : 1pF to 10 µF

OUTPUT $V_{OUT} = Q / C_F$

Where Q is the Charge Created by One Photon or One Particle

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