OEC
Opto-Electronic Components

TÜV MANAGEMENT SERVICE ISO 9001

YOUR PARTNER



# Soft X-Ray, Deep UV Enhanced Series

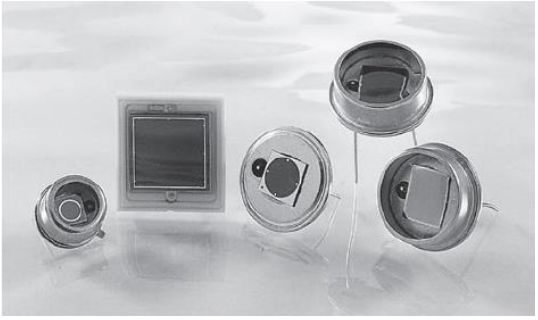
Inversion Layer Silicon Photodiodes

## Features

- Direct Detection
- No Bias Needed
- High Quantum Efficiency
- Low Noise
- High Vacuum Compatible
- Cryogenically Compatible
- 0.070nm to 1100nm Wavelength Range

## Applications

- Electron Detection
- Medical Instrumentation
- Dosimetry
- Radiation Monitoring
- X-ray Spectroscopy
- Charged Particle Detection



OSI Optoelectronics' 1990 R&D 100 award winning X-UV detector series are a unique class of silicon photodiodes designed for additional sensitivity in the X-Ray region of the electromagnetic spectrum without use of any scintillator crystals or screens. Over a wide range of sensitivity from 200 nm to 0.07 nm (6 eV to 17,600 eV), one electron-hole pair is created per 3.63eV of incident energy which corresponds to extremely high stable quantum efficiencies predicted by Eph/3.63eV (See graph below). For measurement of radiation energies above 17.6 keV, refer to the "Fully Depleted High Speed and High Energy Radiation Detectors" section.

A reverse bias can be applied to reduce the capacitance and increase speed of response. In the unbiased mode, these detectors can be used for applications requiring low noise and low drift. These detectors are also excellent choices for detecting light wavelengths between 350 to 1100 nm.

The detectors can be coupled to a charge sensitive preamplifier or low-noise op-amp as shown in the circuit on the opposite page.

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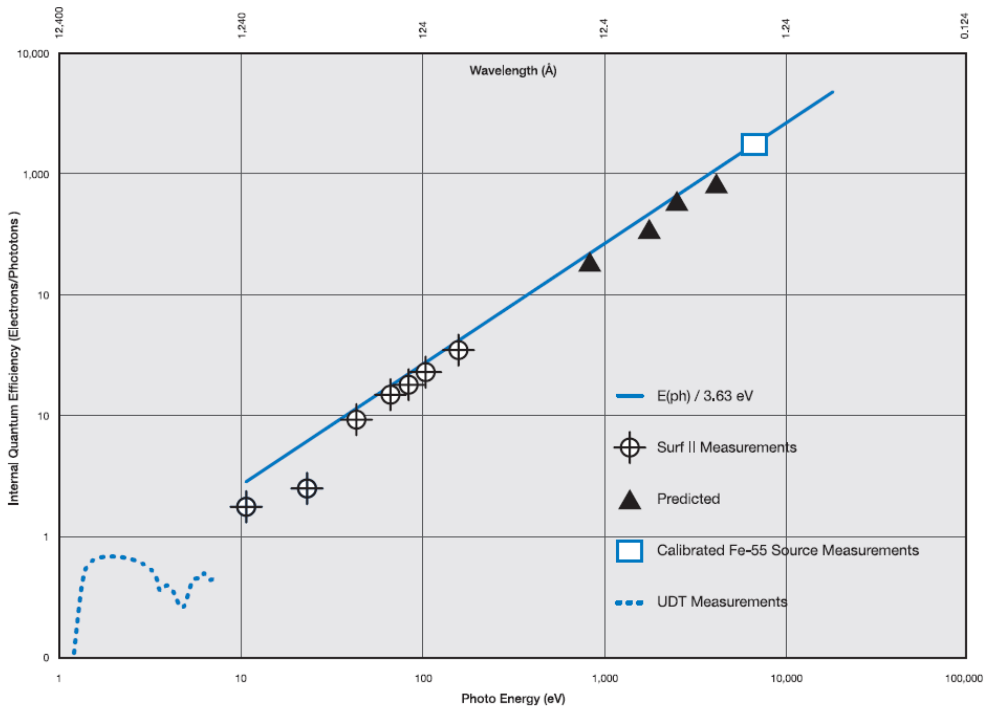
## Typical Quantum Efficiency




## Typical Electro-Optical Specifications at $T_A$=23°C

| Model Number | Active Area | | Capacitance (nF) 0V | | Shunt Resistance (MΩ) -10mV | |
|---|---|---|---|---|---|---|
| | Area (mm²) | Dimensions (mm) | Typ | Max | Min | Typ |
| `XUV´ Series Metal Package | | | | | | |
| XUV-005 | 5 | 2.57 ϕ | 0.3 | 0.5 | 200 | 2000 |
| XUV-020 | 20 | 5.00 ϕ | 1.2 | 1.6 | 50 | 500 |
| XUV-035 | 35 | 6.78 x 5.59 | 2 | 3 | 30 | 300 |
| XUV-100 | 100 | 11.33 ϕ | 6 | 8 | 10 | 100 |
| `XUV´ Series Ceramic Package | | | | | | |
| XUV-50C | 50 | 8.02 ϕ | 2 | 3 | 20 | 200 |
| XUV-100C | 100 | 10.00 sq | 6 | 8 | 10 | 100 |

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| Model Number | NEP (W/√Hz) 0V, 200nm | | Temp. Range (°C) * | | Package Style |
|---|---|---|---|---|---|
| | Typ | Max | Operating | Storage | |
| **`XUV´ Series Metal Package** | | | | | |
| **XUV-005** | 2.9 e -15 | 9.1 e -15 | -20 ~ +60 | -20 ~ +80 | 22/ TO-5 |
| **XUV-020** | 5.8 e -15 | 1.8 e -14 | | | 23/ TO-8 |
| **XUV-035** | 7.4 e -15 | 2.3 e -14 | | | |
| **XUV-100** | 1.3 e -14 | 4.1 e -14 | | | 28/ BNC |
| **`XUV´ Series Ceramic Package** | | | | | |
| **XUV-50C** | 9.1 e -15 | 2.9 e -14 | -20 ~ +60 | -20 ~ +80 | 25/ Ceramic |
| **XUV-100C** | 1.3 e -14 | 4.1 e -14 | | | |

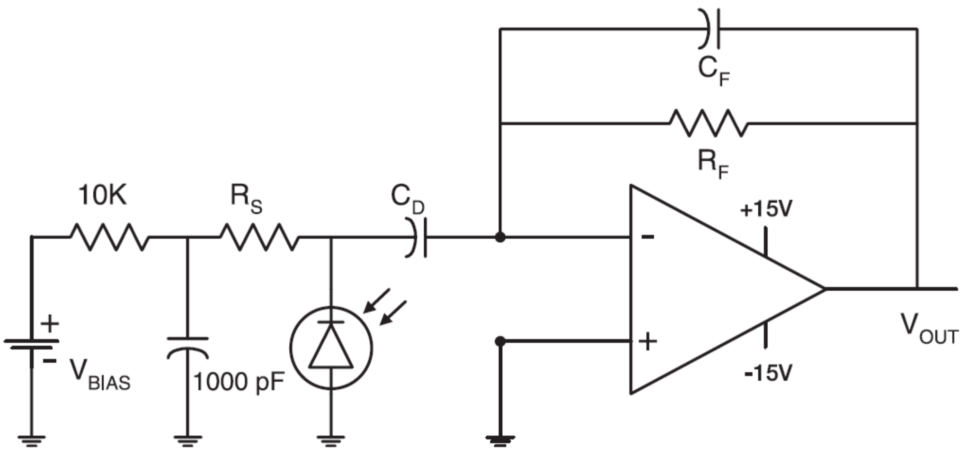
All XUV devices are supplied with removable windows.
* Non-Condensing temperature and Storage Range, Non-Condensing Environment
For mechanical drawings please refer to “Mechanical Drawings”.

In this circuit example, the pre-amplifier is a FET input op-amp or a commercial charge sensitive preamplifier. They can be followed by one or more amplification stages, if necessary. The counting efficiency is directly proportional to the incident radiation power. The reverse bias voltage must be selected so that the best signal-to-noise ratio is achieved.

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.

Amplifier: OPA-637, OPA-27 or similar
$R_F$ : 10 MΩ to 10 GΩ
$R_S$ : 1 MΩ; Smaller for High Counting Rates
$C_F$: 1pF
$C_D$ : 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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## Reverse Bias:

The XUV devices can be operated with a small reverse bias in applications where fast response time is critical. We do not recommend using a reverse bias higher than 5V. Therefore to improve the response time you can use a reverse bias of up to 5V on the detector.

## Impact of Reverse Bias on NEP and Bandwidth:

Applying a reverse Bias will reduce the junction Capacitance of the device resulting in Higher Bandwidth. Also The reverse Bias will increase the dark current of the detector which in turn will increase the NEP.
The exact relation and the calculation of the NEP and Capacitance are explained in the attached application notes.

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