SG01S–5
Broadband SiC based UV photodiode A = 0,06 mm²

### GENERAL FEATURES

**Properties of the SG01S–5 UV photodiode**
- Broadband UVA+UVB+UVC, PTB reported high chip stability
- Active Area A = 0,06 mm²
- TO5 hermetically sealed metal housing, short cap, 1 isolated pin and 1 case pin
- 10mW/cm² peak radiation results a current of approx. 780 nA

**About the material Silicon Carbide (SiC)**
SiC provides the unique property of extreme radiation hardness, near-perfect visible blindness, low dark current, high speed and low noise. These features make SiC the best available material for visible blind semiconductor UV detectors. The SiC detectors can be permanently operated at up to 170°C (338°F). The temperature coefficient of signal (responsivity) is also low, < 0,1%/K. Because of the low noise (dark current in the fA range), very low UV radiation intensities can be measured reliably. Please note that this device needs an appropriate amplifier (see typical circuit on page 3).

### OPTIONS
SiC photodiodes are available with seven different active chip areas from 0,06 mm² up to 36 mm². Standard version is broadband UVA-UVB-UVC. Four filtered versions lead to a tighter sensitivity range. All photodiodes have a hermetically sealed metal housing (TO type), either a 5,5 mm diameter TO18 housing or a 9,2 mm TO5 housing. Further option is either a 2 pin header (1 isolated, 1 grounded) or a 3 pin header (2 isolated, 1 grounded).

### NOMENCLATURE

<table>
<thead>
<tr>
<th>Chip area</th>
<th>Spectral response</th>
<th>Housing</th>
<th>Special</th>
</tr>
</thead>
<tbody>
<tr>
<td>S 0,06 mm²</td>
<td>nothing = broadband</td>
<td>18, 18ISO90, 18S, 5, 5ISO90</td>
<td>nothing, Lens, MEGA, GIGA</td>
</tr>
<tr>
<td>M 0,20 mm²</td>
<td>A = UVA</td>
<td>18ISO90</td>
<td>Lens with concentrating lens, TO5 only</td>
</tr>
<tr>
<td>D 0,50 mm²</td>
<td>B = UVB</td>
<td>18S</td>
<td>GIGA with attenuator up to 0,5 W/cm²</td>
</tr>
<tr>
<td>L 1,00 mm²</td>
<td>C = UVC</td>
<td>5</td>
<td>nothing, Lens, MEGA, GIGA</td>
</tr>
<tr>
<td>XL 7,60 mm²</td>
<td>E = UV-Index</td>
<td>5ISO90</td>
<td>nothing, Lens, MEGA, GIGA</td>
</tr>
</tbody>
</table>

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## SPECIFICATIONS

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Typical Responsivity at Peak Wavelength</td>
<td>$S_{\text{max}}$</td>
<td>0,130</td>
<td>AW$^{-1}$</td>
</tr>
<tr>
<td>Wavelength of max. Spectral Responsivity</td>
<td>$\lambda_{\text{max}}$</td>
<td>280</td>
<td>nm</td>
</tr>
<tr>
<td>Responsivity Range ($S=0,1*S_{\text{max}}$)</td>
<td>-</td>
<td>221 ... 358</td>
<td>nm</td>
</tr>
<tr>
<td>Visible Blindness ($S_{\text{max}}/S_{&gt;405nm}$)</td>
<td>VB</td>
<td>$&gt;10^{10}$</td>
<td>–</td>
</tr>
</tbody>
</table>

### General Characteristics (T=25°C)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Active Area</td>
<td>$A$</td>
<td>0,06</td>
<td>mm²</td>
</tr>
<tr>
<td>Dark Current (1V reverse bias)</td>
<td>$I_d$</td>
<td>0,2</td>
<td>fA</td>
</tr>
<tr>
<td>Capacitance</td>
<td>$C$</td>
<td>15</td>
<td>pF</td>
</tr>
<tr>
<td>Short Circuit (10mW/cm² at peak)</td>
<td>$I_o$</td>
<td>780</td>
<td>nA</td>
</tr>
<tr>
<td>Temperature Coefficient</td>
<td>$T_c$</td>
<td>&lt; 0,1</td>
<td>%/K</td>
</tr>
</tbody>
</table>

### Maximum Ratings

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating Temperature</td>
<td>$T_{\text{opt}}$</td>
<td>-55 ... +170</td>
<td>°C</td>
</tr>
<tr>
<td>Storage Temperature</td>
<td>$T_{\text{stor}}$</td>
<td>-55 ... +170</td>
<td>°C</td>
</tr>
<tr>
<td>Soldering Temperature (35)</td>
<td>$T_{\text{sold}}$</td>
<td>260</td>
<td>°C</td>
</tr>
<tr>
<td>Reverse Voltage</td>
<td>$V_{R_{\text{max}}}$</td>
<td>20</td>
<td>V</td>
</tr>
</tbody>
</table>

## NORMALIZED SPECTRAL RESPONSIVITY

![Normalized Spectral Responsivity Graph](image)

**Specs of 4H SiC Photodiode**

*logarithmic*  *linear*

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FIELD OF VIEW

Measurement Setup:
lamp aperture diameter: 10 mm
distance lamp aperture to second aperture: 17 mm
second aperture diameter: 10 mm
distance second aperture to detector: 93 mm
pivot level = top surface of the photodiode window

TYPICAL CIRCUIT

Calculations and Limits:

\[ U_x = I_x R_x = 0 \Leftrightarrow V_a \]

\[ U_{x_{\text{ref}}} \text{ depends on load and amplifier type} \]

\[ R_x = 10k\Omega \Leftrightarrow 10\,\text{GΩ} \quad C = 3\,\text{pF} \]

Recommendation: \( R_x C \geq 10^{-3}s \)

\[ I_{x_{\text{ref}}} = U_{x_{\text{ref}}} \div R_x \]

Bandwidth = DC ...

\[ \frac{1}{2\pi \times R_x \times C} \]

Example:

\[ I_x = 20nA, \quad R_x = 100\,\text{MΩ}, \quad C = 100\,\text{pF} \]

\[ U_x = 20 \times 10^7 A \times 100 \times 10^{-15}s = 2V \]

DRAWINGS

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**APPLICATION NOTE FOR PHOTODIODES**

For correct reading of the photodiode the current (and NOT the voltage) must be analyzed. This requires a short circuiting of the photodiode. Usual approaches are using a **Picoamperemeter** or a **transimpedance amplifier** circuit as shown on page 3.

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**UPGRADE TO A TOCON OR A PROBE**

**TOCONS = UV sensors with integrated amplifier**

- SiC based UV hybrid detector with amplifier ($0–5\text{ V}$ output), no additional amplifier needed, direct connection to controller, voltmeter, etc.
- Measures intensities from $1.8\text{ pW/cm}^2$ up to $18\text{ W/cm}^2$
- UV broadband, UVA, UVB, UVC or Erythema measurements

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**Miniature housing with M12x1 thread for the TOCON series**

- Optional feature for all TOCON detectors
- Robust stainless steel M12x1 thread body
- Integrated sensor connector (Binder 5-Pin plug) with 2m connector cable
- Easy to mount and connect

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**Industrial UV probes**

- Different housings e.g. with cosine response, water pressure proof or sapphire windows
- Different electronic outputs configurable (voltage, current, USB, CAN)
- Good EMC safety for industrial applications

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**CALIBRATION SERVICE**

- Different NIST and PTB traceable calibrations and measurements for all sglux sensors
- Calibration of sensors for irradiation measurements
- Calibration of UV sensors on discrete wavelengths
- Determination of a specific spectral sensor responsivity