UVB Photodiodes Data Sheets

- Spectral sensitivity from 231 to 309 nm, peak wavelength 280 nm, different packaging, sorted by detector areas.
SG01D–B18
UVB-only SiC based UV photodiode \( A = 0.50 \text{ mm}^2 \)

**GENERAL FEATURES**

**Properties of the SG01D–B18 UV photodiode**
- UVB-only sensitivity, PTB reported high chip stability
- Active Area \( A = 0.50 \text{ mm}^2 \)
- TO18 hermetically sealed metal housing, 1 isolated pin and 1 case pin
- 10\(\mu\)W/cm\(^2\) peak radiation results a current of approx. 6.25 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 mm\(^2\) up to 36 mm\(^2\). 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><strong>SG01</strong></th>
<th>Nothing, A, B, C or E</th>
<th><strong>18, 18ISO90, 18S, 5, 5ISO90</strong></th>
<th>Nothing, Lens, MEGA, GIGA</th>
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</thead>
<tbody>
<tr>
<td><strong>Chip area</strong></td>
<td><strong>Spectral response</strong></td>
<td><strong>Housing</strong></td>
<td><strong>Special</strong></td>
</tr>
<tr>
<td><strong>S</strong></td>
<td>nothing = broadband</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.06 mm(^2)</td>
<td>(\lambda_{\text{max}} = 280 \text{ nm}) (\lambda_{30%} = 221 \text{ nm ... 358 nm})</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>M</strong></td>
<td>A = UVA</td>
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<td>0.20 mm(^2)</td>
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<tr>
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<td>1.00 mm(^2)</td>
<td>(\lambda_{\text{max}} = 275 \text{ nm}) (\lambda_{30%} = 225 \text{ nm ... 287 nm})</td>
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<td><strong>XL</strong></td>
<td>E = UV-Index</td>
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<td>7.60 mm(^2)</td>
<td>spectral response according to CIE087</td>
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SG01D–B18
UVB-only SiC based UV photodiode A = 0,50 mm²

SPECIFICATIONS

<table>
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<th>Parameter</th>
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<th>Unit</th>
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<td><strong>Spectral Characteristics</strong></td>
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<td>AW$^{-1}$</td>
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<td>nm</td>
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<tr>
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<td>VB</td>
<td>&gt; 10$^{10}$</td>
<td>–</td>
</tr>
</tbody>
</table>

| General Characteristics (T=25°C)              |        |             |      |
| Active Area                                   | A      | 0,50        | mm²  |
| Dark Current (1V reverse bias)                | $I_d$  | 1,7         | fA   |
| Capacitance                                   | C      | 125         | pF   |
| Short Circuit (10µW/cm² at peak)              | $I_o$  | 6,25        | nA   |
| Temperature Coefficient                       | $T_c$  | < 0,1       | %/K  |

| Maximum Ratings                               |        |             |      |
| Operating Temperature                         | $T_{\text{opt}}$ | −55 ... +170 | °C   |
| Storage Temperature                           | $T_{\text{stor}}$ | −55 ... +170 | °C   |
| Soldering Temperature (35)                    | $T_{\text{sold}}$ | 260         | °C   |
| Reverse Voltage                               | $V_{\text{Rmax}}$ | 20          | V    |

NORMALIZED SPECTRAL RESPONSIVITY

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Due to our strive for continuous improvement, specifications are subject to change within our PCN policy according to JESD46C.
SG01D–B18
UVB-only SiC based UV photodiode A = 0.50 mm²

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:
- \( U_s = \frac{1}{2} x R_i x C_i \)
- \( U_{peak} \) depends on load and amplifier type
- \( R_i = 10k\Omega \) ...
- \( R_1 = 10\Omega, C = 3pF \)
- Recommendation: \( R_1 x C_1 \geq 10^{-3}s \)
- \( L_{peak} = U_{peak} + R_i \)
- Bandwidth = DC ...
- \( \frac{1}{2\pi R_i C_1} \)

Example:
- \( I_s = 20mA, R_1 = 100\Omega, C_1 = 100 \text{ pF} \)
- \( U_s = 20 \times 10^{-3}A \times 100 \times 10^{-3}\text{s} = 2\text{V} \)

DRAWINGS

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Rev. 6.2 Due to our strive for continuous improvement, specifications are subject to change within our PCN policy according to JESD46C.
TOCONs = UV sensors with integrated amplifier
• SiC based UV hybrid detector with amplifier (0–5V output), no additional amplifier needed, direct connection to controller, voltmeter, etc.
• Measures intensities from 1.8 pW/cm² up to 18 W/cm²
• UV broadband, UVA, UVB, UVC or Erythema measurements

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

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

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.

UPGRADE TO A TOCON OR A PROBE

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
SG01L–B5
UVB-only SiC based UV photodiode A = 1,0 mm²

GENERAL FEATURES

Properties of the SG01L–B5 UV photodiode
- UVB-only sensitivity, PTB reported high chip stability
- Active Area A = 1,0 mm²
- TO5 hermetically sealed metal housing, 1 isolated pin and 1 case pin
- 10µW/cm² peak radiation results a current of approx. 12,5 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

SG01

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<th>S, M, D, L, XL</th>
<th>nothing, A, B, C or E</th>
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<td>Special</td>
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<td>18 2-pin TO18 housing, h = 5,2 mm, 1 pin isolated, 1 pin grounded</td>
<td>Lens with concentrating lens, TO5 only</td>
</tr>
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<td>M 0,20 mm²</td>
<td>A = UVA</td>
<td>18ISO90 3-pin TO18 housing, h = 5,2 mm, 2 pins isolated, 1 pin grounded</td>
<td>MEGA with attenuator up to 0,5 W/cm²</td>
</tr>
<tr>
<td>D 0,50 mm²</td>
<td>B = UVB</td>
<td>18S 2-pin TO18 housing, h = 3,7 mm, 1 pin isolated, 1 pin grounded</td>
<td>GIGA with attenuator up to 7 W/cm²</td>
</tr>
<tr>
<td>L 1,00 mm²</td>
<td>C = UVC</td>
<td>5 2-pin TO5 housing, h = 4,3 mm for broadband; h = 6,7 mm for filtered UVA, UVB, UVC, UVI</td>
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</tr>
<tr>
<td>XL 7,60 mm²</td>
<td>E = UV-Index</td>
<td>5ISO90 3-pin TO5 housing, h = 4,2 mm, 2 pins isolated, 1 pin grounded</td>
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</tr>
</tbody>
</table>

About the chip area Spectral response Housing Special

SG01L–B5 UVB-only SiC based UV photodiode A = 1,0 mm²

GeneraL FeatureS
Rev. 6.2 Due to our strive for continuous improvement, specifications are subject to change within our PCN policy according to JESD46C.
# SPECIFICATIONS

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<tr>
<td><strong>General Characteristics (T=25°C)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Active Area</td>
<td>$A$</td>
<td>1,0</td>
<td>mm$^2$</td>
</tr>
<tr>
<td>Dark Current (1V reverse bias)</td>
<td>$I_d$</td>
<td>3,3</td>
<td>fA</td>
</tr>
<tr>
<td>Capacitance</td>
<td>$C$</td>
<td>250</td>
<td>pF</td>
</tr>
<tr>
<td>Short Circuit (10µW/cm$^2$ at peak)</td>
<td>$I_o$</td>
<td>12,5</td>
<td>nA</td>
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<tr>
<td>Temperature Coefficient</td>
<td>$T_c$</td>
<td>≤ 0,1</td>
<td>%/K</td>
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<tr>
<td><strong>Maximum Ratings</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operating Temperature</td>
<td>$T_{\text{opt}}$</td>
<td>–55 ... +170</td>
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<tr>
<td>Storage Temperature</td>
<td>$T_{\text{stor}}$</td>
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<td>°C</td>
</tr>
<tr>
<td>Soldering Temperature (35)</td>
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</tr>
<tr>
<td>Reverse Voltage</td>
<td>$V_{R_{\text{max}}}$</td>
<td>20</td>
<td>V</td>
</tr>
</tbody>
</table>

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**NORMALIZED SPECTRAL RESPONSIVITY**

![Normalized Spectral Responsivity Chart]

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Rev. 6.2 Due to our strive for continuous improvement, specifications are subject to change within our PCN policy according to JESD46C.
SG01L–B5
UVB-only SiC based UV photodiode A = 1,0 mm²

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:
\[ U_x = \frac{1}{2} R_f \times C, \quad U_{v_{ref}} \] depends on load and amplifier type
\[ R_f = 10kΩ, \quad C = 3pF \]
Recommendation: \[ R_f \times C \geq 10 \Omega \]
\[ I_{v_{ref}} = \frac{U_{v_{ref}}}{R_f} \]

Bandwidth = DC ...

Example:
\[ I_v = 20mA, \quad R_f = 100\Omega, \quad C = 100 \mu F \]
\[ U_v = 20 \times 10^{-6} A \times 100 \times 10^{-5} \Omega = 2V \]

DRAWINGS

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Rev. 6.2 Due to our strive for continuous improvement, specifications are subject to change within our PCN policy according to JESD46C.
**SG01L–B5**

UVB-only SiC based UV photodiode $A = 1,0$ mm$^2$

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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.

---

**UPGRADE TO A TOCON OR A PROBE**

**TOCONS = UV sensors with integrated amplifier**

- SiC based UV hybrid detector with amplifier (0–5V output), no additional amplifier needed, direct connection to controller, voltmeter, etc.
- Measures intensities from 1,8 pW/cm$^2$ up to 18 W/cm$^2$
- UV broadband, UVA, UVB, UVC or Erythema measurements

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

- Optional feature for all TOCON detectors
- Robust stainless steel M12x1 thread body
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- Easy to mount and connect

**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

---

**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
SG01L–B18
UVB-only SiC based UV photodiode A = 1,0 mm²

GENERAL FEATURES

Properties of the SG01L–B18 UV photodiode
- UVB-only sensitivity, PTB reported high chip stability
- Active Area A = 1,0 mm²
- TO18 hermetically sealed metal housing, 1 isolated pin and 1 case pin
- 10µW/cm² peak radiation results a current of approx. 12,5 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

SG01

S, M, D, L, XL nothing, A, B, C or E

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</tr>
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Chip area Spectral response Housing Special

SG01L–B18 UVB-only SiC based UV photodiode A = 1,0 mm²

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SG01L–B18
UVB-only SiC based UV photodiode $A = 1,0 \text{ mm}^2$

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**NORMALIZED SPECTRAL RESPONSIVITY**

![Normalized Spectral Responsivity Graph](image_url)

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**Rev. 6.2** Due to our strive for continuous improvement, specifications are subject to change within our PCN policy according to JESD46C.
**SG01L–B18**

UVB-only SiC based UV photodiode $A = 1.0 \text{ mm}^2$

**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:
- $U_x = \frac{1}{2} \times R_{x} \times C_x$
- $U_{x\text{max}}$ depends on load and amplifier type
- $R_{x} = 10 \text{k}\Omega \ldots 10 \text{G}\Omega$, $C_x = 3 \text{ pF}$
- Recommendation: $R_x \times C_x \geq 10^{-3}$
- $I_{x\text{max}} = U_{x\text{max}} \div R_x$
- Bandwidth = DC $\ldots \frac{1}{2 \pi \times R_x \times C_x}$

Example:
- $I_x = 20 \text{nA}$, $R_x = 100 \text{M}\Omega$, $C_x = 100 \text{ pF}$
- $U_x = 20 \times 10^{-3} \times 100 \times 10^{-12} = 2 \text{V}$

**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.

UPGRADE TO A TOCON OR A PROBE

TOCONs = UV sensors with integrated amplifier
- SiC based UV hybrid detector with amplifier (0–5V output), no additional amplifier needed, direct connection to controller, voltmeter, etc.
- Measures intensities from 1.8 pW/cm² up to 18 W/cm²
- UV broadband, UVA, UVB, UVC or Erythema measurements

Miniature housing with M12x1 thread for the TOCON series
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- Easy to mount and connect

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- 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

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
SG01M–B5
UVB-only SiC based UV photodiode A = 0,20 mm²

**Properties of the SG01M–B5 UV photodiode**

- UVB-only sensitivity, PTB reported high chip stability
- Active Area A = 0,20 mm²
- TO5 hermetically sealed metal housing, 1 isolated pin and 1 case pin
- 10mW/cm² peak radiation results a current of approx. 2500 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><strong>S</strong></td>
<td>nothing = broadband</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0,06 mm²</td>
<td>λ&lt;sub&gt;max&lt;/sub&gt; = 280 nm, λ&lt;sub&gt;3σ%&lt;/sub&gt; = 221 nm ... 358 nm</td>
<td>s18</td>
<td>Lens with concentrating lens, TO5 only</td>
</tr>
<tr>
<td><strong>M</strong></td>
<td>A = UVA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0,20 mm²</td>
<td>λ&lt;sub&gt;max&lt;/sub&gt; = 331 nm, λ&lt;sub&gt;3σ%&lt;/sub&gt; = 309 nm ... 367 nm</td>
<td>s18ISO90</td>
<td>MEGA with attenuator up to 0,5 W/cm²</td>
</tr>
<tr>
<td><strong>D</strong></td>
<td>B = UVB</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0,50 mm²</td>
<td>λ&lt;sub&gt;max&lt;/sub&gt; = 280 nm, λ&lt;sub&gt;3σ%&lt;/sub&gt; = 231 nm ... 309 nm</td>
<td>s18S</td>
<td>GIGA with attenuator up to 7 W/cm²</td>
</tr>
<tr>
<td><strong>L</strong></td>
<td>C = UVC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1,00 mm²</td>
<td>λ&lt;sub&gt;max&lt;/sub&gt; = 275 nm, λ&lt;sub&gt;3σ%&lt;/sub&gt; = 225 nm ... 287 nm</td>
<td>s5</td>
<td></td>
</tr>
<tr>
<td><strong>XL</strong></td>
<td>E = UV-Index</td>
<td></td>
<td></td>
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<tr>
<td>7,60 mm</td>
<td>spectral response according to CIE087</td>
<td>s18ISO90</td>
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</table>
SG01M–B5
UVB-only SiC based UV photodiode A = 0,20 mm²

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_{max}</td>
<td>0,125</td>
<td>AW⁻¹</td>
</tr>
<tr>
<td>Wavelength of max. Spectral Responsivity</td>
<td>\lambda_{max}</td>
<td>280</td>
<td>nm</td>
</tr>
<tr>
<td>Responsivity Range (S=0,1*S_{max})</td>
<td>–</td>
<td>231 ... 309</td>
<td>nm</td>
</tr>
<tr>
<td>Visible Blindness (S_{max}/S_{&lt;405nm})</td>
<td>VB</td>
<td>&gt; 10^{10}</td>
<td>–</td>
</tr>
</tbody>
</table>

**General Characteristics (T=25°C)**

| Active Area                                   | A      | 0,20   | mm²     |
| Dark Current (1V reverse bias)                | I_{d}  | 0,7    | fA      |
| Capacitance                                   | C      | 50     | pF      |
| Short Circuit (10mW/cm² at peak)              | I_{o}  | 2500   | nA      |
| Temperature Coefficient                       | T_{c}  | < 0,1  | %/K     |

**Maximum Ratings**

| Operating Temperature                         | T_{opt}| −55 ... +170 | °C     |
| Storage Temperature                           | T_{stor}| −55 ... +170 | °C     |
| Soldering Temperature (35)                    | T_{sold} | 260  | °C     |
| Reverse Voltage                               | V_{R_{max}} | 20  | V      |

**Normalized Spectral Responsivity**

[Graph of normalized spectral responsivity]

Specs of 4H SiC Photodiode with UVB filter
- Logarithmic
- Linear

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**SG01M–B5**

UVB-only SiC based UV photodiode $A = 0.20 \text{ mm}^2$

**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:
- $U_i = \ell \cdot R_i = 0 \ldots \sim V_a$
- $U_{\text{out}}$ depends on load and amplifier type
- $R_i = 10 \Omega \ldots \sim 10 \text{k}\Omega$, $C_i = 3 \text{ pF}$
- Recommendation: $R_i \cdot C_i \geq 10^{-4} \text{s}$
- $U_{\text{out}} = U_{\text{in}} + R_i$
- Bandwidth = DC ...
  \[ \frac{1}{2 \pi \cdot R_i \cdot C_i} \]
- Example:
  - $I_i = 20 \text{nA}$, $R_i = 100 \text{M}\Omega$, $C_i = 100 \text{ pF}$
  - $U_i = 20 \times 10^9 \times 100 \times 10^{-5} = 2V$

**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.

**UPGRADE TO A TOCON OR A PROBE**

**TOCONs = UV sensors with integrated amplifier**
- SiC based UV hybrid detector with amplifier (0–5V output), no additional amplifier needed, direct connection to controller, voltmeter, etc.
- Measures intensities from 1,8 pW/cm² up to 18 W/cm²
- UV broadband, UVA, UVB, UVC or Erythema measurements

**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

**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

**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

---

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Rev. 6.2 Due to our strive for continuous improvement, specifications are subject to change within our PCN policy according to JESD46C.
SG01M–B18
UVB-only SiC based UV photodiode $A = 0.20 \text{ mm}^2$

**GENERAL FEATURES**

**Properties of the SG01M–B18 UV photodiode**
- UVB-only sensitivity, PTB reported high chip stability
- Active Area $A = 0.20 \text{ mm}^2$
- TO18 hermetically sealed metal housing, 1 isolated pin and 1 case pin
- 10mW/cm² peak radiation results a current of approx. 2500 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 5.4 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**

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<thead>
<tr>
<th>Chip area</th>
<th>Spectral response</th>
<th>Housing</th>
<th>Special</th>
</tr>
</thead>
<tbody>
<tr>
<td>S</td>
<td>nothing = broadband</td>
<td>$\lambda_{\text{max}} = 280 \text{ nm}$, $\lambda_{S10%} = 221 \text{ nm}$ ... 358 nm</td>
<td>2-pin TO18 housing, $h = 5.2 \text{ mm}$, 1 pin isolated, 1 pin grounded</td>
</tr>
<tr>
<td>M</td>
<td>$A = \text{UVA}$</td>
<td>$\lambda_{\text{max}} = 331 \text{ nm}$, $\lambda_{S10%} = 309 \text{ nm}$ ... 367 nm</td>
<td>3-pin TO18 housing, $h = 5.2 \text{ mm}$, 2 pins isolated, 1 pin grounded</td>
</tr>
<tr>
<td>D</td>
<td>$B = \text{UVB}$</td>
<td>$\lambda_{\text{max}} = 280 \text{ nm}$, $\lambda_{S10%} = 231 \text{ nm}$ ... 309 nm</td>
<td>2-pin TO18 housing, $h = 3.7 \text{ mm}$, 1 pin isolated, 1 pin grounded</td>
</tr>
<tr>
<td>L</td>
<td>$C = \text{UVC}$</td>
<td>$\lambda_{\text{max}} = 275 \text{ nm}$, $\lambda_{S10%} = 225 \text{ nm}$ ... 287 nm</td>
<td>2-pin TO5 housing, $h = 4.3 \text{ mm}$ for broadband; $h = 6.7 \text{ mm}$ for filtered UVA, UVB, UVC, UVI</td>
</tr>
<tr>
<td>XL</td>
<td>$E = \text{UV-Index}$</td>
<td>spectral response according to CIEo87</td>
<td>3-pin TO5 housing, $h = 4.2 \text{ mm}$, 2 pins isolated, 1 pin grounded</td>
</tr>
</tbody>
</table>
SG01M–B18
UVB-only SiC based UV photodiode A = 0,20 mm²

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>Smax</td>
<td>0,125</td>
<td>AW–1</td>
</tr>
<tr>
<td>Wavelength of max. Spectral Responsivity</td>
<td>λmax</td>
<td>280</td>
<td>nm</td>
</tr>
<tr>
<td>Responsivity Range (S=0,1*Smax)</td>
<td>–</td>
<td>231 ... 309</td>
<td>nm</td>
</tr>
<tr>
<td>Visible Blindness (Smax/S&gt;405nm)</td>
<td>VB</td>
<td>&gt; 10¹⁰</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>0,20</td>
<td>mm²</td>
</tr>
<tr>
<td>Dark Current (1V reverse bias)</td>
<td>Id</td>
<td>0,7</td>
<td>fA</td>
</tr>
<tr>
<td>Capacitance</td>
<td>C</td>
<td>50</td>
<td>pF</td>
</tr>
<tr>
<td>Short Circuit (10mW/cm² at peak)</td>
<td>Io</td>
<td>2500</td>
<td>nA</td>
</tr>
<tr>
<td>Temperature Coefficient</td>
<td>Tc</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>Topt</td>
<td>-55 ... +170</td>
<td>°C</td>
</tr>
<tr>
<td>Storage Temperature</td>
<td>Tstor</td>
<td>-55 ... +170</td>
<td>°C</td>
</tr>
<tr>
<td>Soldering Temperature (35)</td>
<td>Tsold</td>
<td>260</td>
<td>°C</td>
</tr>
<tr>
<td>Reverse Voltage</td>
<td>Vrmax</td>
<td>20</td>
<td>V</td>
</tr>
</tbody>
</table>

NORMALIZED SPECTRAL RESPONSIVITY

![Normalized Spectral Responsivity Graph](image)

Specs of 4H SiC Photodiode with UVB filter
- logarithmic
- linear

REV. 6.2  Due to our strive for continuous improvement, specifications are subject to change within our PCN policy according to JESD46C.
SG01M–B18
UVB-only SiC based UV photodiode A = 0.20 mm²

FIELD OF VIEW

Measurement Setup:
- lamp aperture diameter: 10 mm
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- pivot level = top surface of the photodiode window

TYPICAL CIRCUIT

Calculations and Limits:
- \( U_s = I_x R_x \approx 0 \ldots \approx V_s \)
- \( U_{x,v} \), depends on load and amplifier type
- \( R_x = 10k\Omega \ldots \approx 10G\Omega, C_x \approx 3pF \)
- Recommendation: \( R_x C_x \geq 10^{-3}s \)
- \( I_{v,x} = U_{x,v} \div R_x \)
- Bandwidth = DC ...

\[
\frac{1}{2 \pi R_x C_x}
\]

Example:
- \( I_s = 20mA, R_x = 100M\Omega, C_x = 100 \mu F \)
- \( U_s = 20 \times 10^3A \times 100 \times 10^{-3}T = 2V \)

DRAWINGS

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- Determination of a specific spectral sensor responsivity
SG01S–B18
UVB-only SiC based UV photodiode A = 0,06 mm²

GENERAL FEATURES

Properties of the SG01S–B18 UV photodiode
- UVB-only sensitivity, PTB reported high chip stability
- Active Area A = 0,06 mm²
- TO18 hermetically sealed metal housing, 1 isolated pin and 1 case pin
- 10mW/cm² peak radiation results a current of approx. 750 nA

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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).

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<th>Spectral response</th>
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</tr>
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<tbody>
<tr>
<td>S, M, D, L, XL</td>
<td>nothing, A, B, C or E</td>
<td>18, 18ISO90, 18S, 5, 5ISO90</td>
<td>nothing, Lens, MEGA, GIGA</td>
</tr>
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<td>D, 0,50 mm²</td>
<td>B = UVB</td>
<td>18S</td>
<td>GIGA with attenuator up to 7 W/cm²</td>
</tr>
<tr>
<td>L, 1,00 mm²</td>
<td>C = UVC</td>
<td>5ISO90</td>
<td></td>
</tr>
<tr>
<td>XL, 7,60 mm²</td>
<td>E = UV-Index</td>
<td>5ISO90</td>
<td></td>
</tr>
</tbody>
</table>

Spectral response:
- λmax = 280 nm
- λS10% = 221 nm ...
- λmax = 331 nm
- λS10% = 309 nm ...
- λmax = 280 nm
- λS10% = 231 nm ...
- λmax = 275 nm
- λS10% = 225 nm ...
- spectral response according to CIE087
SG01S−B18
UVB-only SiC based UV photodiode A = 0,06 mm²

SPECIFICATIONS

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<td>General Characteristics (T=25°C)</td>
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<td></td>
</tr>
<tr>
<td>Active Area</td>
<td>A</td>
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<td>mm²</td>
</tr>
<tr>
<td>Dark Current (1V reverse bias)</td>
<td>$I_d$</td>
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<td>fA</td>
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<tr>
<td>Capacitance</td>
<td>C</td>
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<td>pF</td>
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<td>Short Circuit (10mW/cm² at peak)</td>
<td>$I_o$</td>
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<td>nA</td>
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<td>Temperature Coefficient</td>
<td>$T_c$</td>
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<td>%/K</td>
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</tr>
<tr>
<td>Soldering Temperature (35s)</td>
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<td>260</td>
<td>°C</td>
</tr>
<tr>
<td>Reverse Voltage</td>
<td>$V_{\text{Rmax}}$</td>
<td>20</td>
<td>V</td>
</tr>
</tbody>
</table>

NORMALIZED SPECTRAL RESPONSIVITY

![Normalized Spectral Responsivity Graph](image-url)

Specs of 4H SiC Photodiode with UVB filter
- logarithmic
- linear

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SG01S–B18
UVB-only SiC based UV photodiode A = 0.06 mm²

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:
\[ U_i = I_x R_i \Rightarrow 0 \Rightarrow V_x \]

\[ U_{V+V} \text{ depends on load and amplifier type} \]

\[ R_i = 10k\Omega \Rightarrow 10G\Omega, C_x \geq 3pF \]

Recommendation: \( R_i \times C_x \geq 10^{-3} \text{s} \)

\[ I_{V+} = U_{V+} + R_i \]

Bandwidth = DC … \[ \frac{1}{2 \times R_i x C_x} \]

Example:
- \( I_x = 20nA, R_i = 100\text{M}\Omega, C_x = 100 \text{ pF} \)
- \( U_i = 20 \times 10^{-3} \text{A} \times 100 \times 10^{-12} \text{V} = 2V \)

DRAWINGS

- Cathode (isolated pin)
- Anode (case pin)
- Chip position ± 50 μm
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.

UPGRADE TO A TOCON OR A PROBE

TOCONS = UV sensors with integrated amplifier
- SiC based UV hybrid detector with amplifier (0–5V output), no additional amplifier needed, direct connection to controller, voltmeter, etc.
- Measures intensities from 1.8 pW/cm² up to 18 W/cm²
- UV broadband, UVA, UVB, UVC or Erythema measurements

Miniature housing with M12x1 thread for the TOCON series
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- Different electronic outputs configurable (voltage, current, USB, CAN)
- Good EMC safety for industrial applications

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
SG01XL–B5
UVB-only SiC based UV photodiode A = 7,6 mm²

GENERAL FEATURES

Properties of the SG01XL–B5 UV photodiode
• UVB-only sensitivity, PTB reported high chip stability
• Active Area A = 7,6 mm²
• TO5 hermetically sealed metal housing, 1 isolated pin and 1 case pin
• 10µW/cm² peak radiation results a current of approx. 95 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</td>
<td>nothing = broadband</td>
<td>2-pin TO18 housing, h = 5,2 mm, 1 pin isolated, 1 pin grounded</td>
<td>Lens with concentrating lens, TO5 only</td>
</tr>
<tr>
<td></td>
<td>λ_max = 280 nm</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>λ_S10% = 221 nm ... 358 nm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>A = UVA</td>
<td>3-pin TO18 housing, h = 5,2 mm, 2 pins isolated, 1 pin grounded</td>
<td>MEGA with attenuator up to 0,5 W/cm²</td>
</tr>
<tr>
<td></td>
<td>λ_max = 331 nm</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>λ_S10% = 309 nm ... 367 nm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>B = UVB</td>
<td>2-pin TO18 housing, h = 3,7 mm, 1 pin isolated, 1 pin grounded</td>
<td>GIGA with attenuator up to 7 W/cm²</td>
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<tr>
<td></td>
<td>λ_max = 280 nm</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>λ_S10% = 231 nm ... 309 nm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>L</td>
<td>C = UVC</td>
<td>2-pin TO5 housing, h = 4,3 mm for broadband; h = 6,7 mm for filtered UVA, UVB, UVC, UVI</td>
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<tr>
<td></td>
<td>λ_max = 275 nm</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>λ_S10% = 225 nm ... 287 nm</td>
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<tr>
<td>XL</td>
<td>E = UV-Index</td>
<td>3-pin TO5 housing, h = 4,2 mm, 2 pins isolated, 1 pin grounded</td>
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<tr>
<td></td>
<td>spectral response according to CIEo87</td>
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</tbody>
</table>
**SG01XL–B5**  
UVB-only SiC based UV photodiode A = 7,6 mm²

### SPECIFICATIONS

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Value</th>
<th>Unit</th>
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</thead>
<tbody>
<tr>
<td><strong>Spectral Characteristics</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Typical Responsivity at Peak Wavelength</td>
<td>$S_{\text{max}}$</td>
<td>0,125</td>
<td>AW $^{-1}$</td>
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<tr>
<td>Wavelength of max. Spectral Responsivity</td>
<td>$\lambda_{\text{max}}$</td>
<td>280</td>
<td>nm</td>
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<tr>
<td>Responsivity Range ($S=0,1* S_{\text{max}}$)</td>
<td>–</td>
<td>231 ... 309</td>
<td>nm</td>
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<tr>
<td>Visible Blindness ($S_{\text{max}}/ S_{&gt;405nm}$)</td>
<td>VB</td>
<td>$&gt;10^{10}$</td>
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<tr>
<td><strong>General Characteristics (T=25°C)</strong></td>
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<tr>
<td>Active Area</td>
<td>A</td>
<td>7,6</td>
<td>mm²</td>
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<tr>
<td>Dark Current (1V reverse bias)</td>
<td>$I_d$</td>
<td>25,3</td>
<td>fA</td>
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<tr>
<td>Capacitance</td>
<td>C</td>
<td>1900</td>
<td>pF</td>
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<td>Short Circuit (10µW/cm² at peak)</td>
<td>$I_o$</td>
<td>95</td>
<td>nA</td>
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<td>Temperature Coefficient</td>
<td>$T_c$</td>
<td>$&lt;0,1$</td>
<td>%/K</td>
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<td><strong>Maximum Ratings</strong></td>
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<tr>
<td>Operating Temperature</td>
<td>$T_{\text{opt}}$</td>
<td>$-55 ... +170$</td>
<td>°C</td>
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<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>
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<tr>
<td>Reverse Voltage</td>
<td>$V_{\text{Rmax}}$</td>
<td>20</td>
<td>V</td>
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**SG01XL–B5**
UVB-only SiC based UV photodiode $A = 7.6 \text{ mm}^2$

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Calculations and Limits:
- $U_x = I_x R_x \propto 0 \cdots \sim V_x$
- $U_{\text{max}}$, depends on load and amplifier type
- $R_x = 10\,\Omega \cdots \sim 10\,\text{G}\Omega$, $C_x = 3\,\text{pF}$
- Recommendation: $R_x C_x \geq 10^{-3}$
- $I_{\text{max}} = U_{\text{max}} + R_x$
- Bandwidth = DC ...
- $\frac{1}{2\pi \times R_x \times C_x}$

Example:
- $I_x = 20\,\mu\text{A}$, $R_x = 100\,\text{M}\Omega$, $C_x = 100\,\text{pF}$
- $U_x = 20 \times 10^{-3} \times 100 \times 10^{-5} \Omega = 2\,\text{V}$

**DRAWINGS**

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