UVC Photodiodes
Data Sheets

• Spectral sensitivity from 225 to 287 nm, peak wavelength 275 nm, according to DVGW W294/3 and OENORM M5873, different packaging, sorted by detector areas.

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SG01D–C18
UVC-only SiC based UV photodiode A = 0.50 mm²

GENERAL FEATURES

Properties of the SG01D–C18 UV photodiode
- UVC-only sensitivity, compliant with DVGW W294, PTB reported high chip stability
- Active Area A = 0.50 mm²
- TO18 hermetically sealed metal housing, 1 isolated pin and 1 case pin
- 10µW/cm² peak radiation results a current of approx. 6 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
SG01D–C18
UVC-only SiC based UV photodiode A = 0,50 mm²

SPECIFICATIONS

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<th>Parameter</th>
<th>Symbol</th>
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<td>Active Area</td>
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<td>Dark Current (1V reverse bias)</td>
<td>$I_d$</td>
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<td>fA</td>
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<td>C</td>
<td>125</td>
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<td>Short Circuit (10µW/cm² at peak)</td>
<td>$I_o$</td>
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<td>ºC</td>
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<td>$V_{R_{\text{max}}}$</td>
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NORMALIZED SPECTRAL RESPONSIVITY
**SG01D–C18**
UVC-only SiC based UV photodiode $A = 0.50 \text{ mm}^2$

**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:
$V_s = \frac{1}{2} \times \frac{1}{R_1 \times C_1}$
$U_{\text{ref.}}$ depends on load and amplifier type
$R_1 = 10 k\Omega \ldots 100 M\Omega$, $C_1 = 100 \text{ pF}$
Recommendation: $R_1 \times C_1 \geq 10 \text{ s}$
$L_{\text{ref.}} = U_{\text{ref.}} + R_1$

Example:
$I_L = 200 \mu A$, $R_1 = 100 \text{ M\Omega}$, $C_1 = 100 \text{ pF}$
$U_s = 20 \times 10^5 \times 100 \times 10^5 \mu \text{A} = 2 \text{V}$

**DRAWINGS**

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Rev. 6.3  Due to our strive for continuous improvement, specifications are subject to change within our PCN policy according to JESD46C.
SG01D–C18
UVC-only SiC based UV photodiode A = 0.50 mm²

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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SG01L–C5
UVC-only SiC based UV photodiode A = 1,0 mm²

GENERAL FEATURES

**Properties of the SG01L–C5 UV photodiode**
- UVC-only sensitivity, compliant with DVGW W294, 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 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>Spectral response</th>
<th>Housing</th>
<th>Special</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>S</strong> 0,06 mm²</td>
<td>nothing = broadband</td>
<td>18, 18ISO90, 18S, 5, 5ISO90</td>
<td>nothing, Lens, MEGA, GIGA</td>
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<tr>
<td><strong>M</strong> 0,20 mm²</td>
<td>A = UVA, λ_{max} = 331 nm, λ_{S10%} = 309 nm ... 367 nm</td>
<td>18ISO90</td>
<td>Lens with concentrating lens, TO5 only</td>
</tr>
<tr>
<td><strong>D</strong> 0,50 mm²</td>
<td>B = UVB, λ_{max} = 280 nm, λ_{S10%} = 231 nm ... 309 nm</td>
<td>18S</td>
<td>MEGA with attenuator up to 0,5 W/cm²</td>
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<td><strong>L</strong> 1,00 mm²</td>
<td>C = UVC, λ_{max} = 275 nm, λ_{S10%} = 225 nm ... 287 nm</td>
<td>5ISO90</td>
<td>GIGA with attenuator up to 7 W/cm²</td>
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<tr>
<td><strong>XL</strong> 7,60 mm²</td>
<td>E = UV-Index, spectral response according to CIE087</td>
<td>5ISO90</td>
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SG01L–C5
UVC-only SiC based UV photodiode A = 1,0 mm²

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<td>Dark Current (1V reverse bias)</td>
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<td>Short Circuit (10µW/cm² at peak)</td>
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NORMALIZED SPECTRAL RESPONSIVITY

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

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SG01L–C5
UVC-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:
\[ U_s = \frac{1}{2\pi R_i C} \]
\[ U_{sys} \text{ depends on load and amplifier type} \]
\[ R_i = 10k\Omega \rightarrow 10G\Omega, \quad C \approx 3pF \]
Recommendation: \( R_i \times C \geq 10^{-5}s \)
\[ I_s = I_{sys} + R_i \]

Bandwidth = DC ...

Example:
\[ I_s = 20\mu A, \quad R_i = 100M\Omega, \quad C \approx 100 \text{ pF} \]
\[ U_s = 20 \times 10^5 \times 100 \times 10^{-5} \approx 2V \]

DRAWINGS
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
SG01L–C18
UVC-only SiC based UV photodiode A = 1,0 mm²

GENERAL FEATURES

Properties of the SG01L–C18 UV photodiode
- UVC-only sensitivity, compliant with DVGW W294, PTB reported high chip stability
- Active Area A = 1,0 mm²
- TO18 hermetically sealed metal housing, 1 isolated pin and 1 case pin
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SG01

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<td>2-pin TO18 housing, h = 5.2 mm, 1 pin isolated, 1 pin grounded</td>
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<td>MEGA with attenuator up to 0,5 W/cm²</td>
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<td>L</td>
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<td>2-pin TO5 housing, h = 4,3 mm for broadband; h = 6,7 mm for filtered UVA, UVB, UVC, UVI</td>
<td>GIGA with attenuator up to 7 W/cm²</td>
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SG01L–C18
UVC-only SiC based UV photodiode A = 1,0 mm²
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**NORMALIZED SPECTRAL RESPONSIVITY**

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

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### FIELD OF VIEW

Measurements 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:**

- $U_i = I_i R_i = \ldots = V_a$
- $U_{\text{max}}$ depends on load and amplifier type
  - $R_i = 10 \Omega \ldots \sim 10 \text{k}\Omega$, $C = 3 \text{ pF}$
  - Recommendation: $R_i \times C \geq 10\,\text{s}$
  - $U_{\text{max}} = U_i + R_i$
- Bandwidth = DC ...

**Example:**

- $I_i = 20 \text{nA}$, $R_i = 100 \text{k}\Omega$, $C = 100 \text{ pF}$
- $U_i = 20 \times 10^3 \text{A} \times 100 \times 10^3[\text{s}] = 2 \text{V}$

### DRAWINGS

- **Cathode (isolated pin)**
- **Anode (case pin)**
- **Chip position $\pm 50 \mu\text{m}$**
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.
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- Calibration of sensors for irradiation measurements
- Calibration of UV sensors on discrete wavelengths
- Determination of a specific spectral sensor responsivity
SG01M–C5
UVC-only SiC based UV photodiode A = 0,20 mm²

GENERAL FEATURES

Properties of the SG01M–C5 UV photodiode
- UVC-only sensitivity, compliant with DVGW W294, 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. 2400 nA

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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

<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>S 2-pin TO18 housing, h = 5,2 mm, 1 pin isolated, 1 pin grounded</td>
<td>nothing, Lens, MEGA, GIGA</td>
</tr>
<tr>
<td>M (0,20 mm²)</td>
<td>A = UVA, λₘₐₓ = 280 nm, λ₃ₐ₃% = 221 nm ... 358 nm</td>
<td>SISO90 3-pin TO18 housing, h = 5,2 mm, 2 pins isolated, 1 pin grounded</td>
<td></td>
</tr>
<tr>
<td>D (0,50 mm²)</td>
<td>B = UVB, λₘₐₓ = 311 nm, λ₃ₐ₃% = 309 nm ... 376 nm</td>
<td>SISO90 3-pin TO5 housing, h = 4,2 mm, 2 pins isolated, 1 pin grounded</td>
<td></td>
</tr>
<tr>
<td>L (1,00 mm²)</td>
<td>C = UVC, λₘₐₓ = 275 nm, λ₃ₐ₃% = 225 nm ... 287 nm</td>
<td>GIGA with attenuator up to 7 W/cm²</td>
<td></td>
</tr>
<tr>
<td>XL (7,60 mm²)</td>
<td>E = UV-Index, spectral response according to CIE087</td>
<td>GIGA with attenuator up to 7 W/cm²</td>
<td></td>
</tr>
</tbody>
</table>
SG01M–C5
UVC-only SiC based UV photodiode A = 0,20 mm²

SPECIFICATIONS

<table>
<thead>
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<th>Parameter</th>
<th>Symbol</th>
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<th>Unit</th>
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<tr>
<td><strong>Spectral Characteristics</strong></td>
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<tr>
<td>Typical Responsivity at Peak Wavelength</td>
<td>$S_{\text{max}}$</td>
<td>0,120</td>
<td>AW $^{-1}$</td>
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<td>Wavelength of max. Spectral Responsivity</td>
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<td>Responsivity Range ($S=0,1*S_{\text{max}}$)</td>
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<td>225...287</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>
<tr>
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<tr>
<td>Active Area</td>
<td>A</td>
<td>0,20</td>
<td>mm²</td>
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<tr>
<td>Dark Current (1V reverse bias)</td>
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<td>0,7</td>
<td>fA</td>
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<td>Capacitance</td>
<td>C</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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<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>
</tr>
<tr>
<td>Storage Temperature</td>
<td>$T_{\text{stor}}$</td>
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<td>°C</td>
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<tr>
<td>Soldering Temperature (35)</td>
<td>$T_{\text{sold}}$</td>
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<td>°C</td>
</tr>
<tr>
<td>Reverse Voltage</td>
<td>$V_{R_{\text{max}}}$</td>
<td>20</td>
<td>V</td>
</tr>
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</table>

NORMAIZED SPECTRAL RESPONSIVITY

![Normalized Spectral Responsivity Graph](image)

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

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SG01M–C5

UVC-only SiC based UV photodiode A = 0.20 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:
- $U_s = I_s R_s = 6 \ldots V_s$
- $U_{sat}$ depends on load and amplifier type
- $R_s = 10k \Omega \ldots 10M \Omega$, $C_s = 3 \mu F$
- Recommendation: $R_s C_s > 10^{-6}$ s
- $I_{sat} = \frac{U_{sat}}{R_s}$
- Bandwidth = DC ...
- $\frac{1}{2 \pi R_s C_s}$
- Example:
  $I_s = 20mA$, $R_s = 100\Omega$, $C_s = 100 \mu F$
  $U_s = 20 \times 10^{-3} \times 100 \times 10^{-6} \Omega = 2V$

DRAWINGS

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SG01M–C5
UVC-only SiC based UV photodiode A = 0,20 mm²

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

REV. 6.3 Due to our strive for continuous improvement, specifications are subject to change within our PCN policy according to JESD46C.
SG01S–C5
UVC-only SiC based UV photodiode A = 0,06 mm²

GENERAL FEATURES

Properties of the SG01S–C5 UV photodiode
• UVC-only sensitivity, compliant with DVGW W294, PTB reported high chip stability
• Active Area A = 0,06 mm²
• TO5 hermetically sealed metal housing, 1 isolated pin and 1 case pin
• 10mW/cm² peak radiation results a current of approx. 720 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).

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<th>Housing</th>
<th>Special</th>
</tr>
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<tbody>
<tr>
<td>S 0,06 mm²</td>
<td>nothing = broadband ( \lambda_{\text{max}} = 280 \text{ nm} ), ( \lambda_{\text{S10%}} = 221 \text{ nm} ) ... 358 nm</td>
<td>2-pin TO18 housing, h = 5,2 mm, 1 pin isolated, 1 pin grounded</td>
<td>nothing, Lens, MEGA, GIGA</td>
</tr>
<tr>
<td>M 0,20 mm²</td>
<td>A = UVA ( \lambda_{\text{max}} = 331 \text{ nm} ), ( \lambda_{\text{S10%}} = 309 \text{ nm} ) ... 367 nm</td>
<td>3-pin TO18 housing, h = 5,2 mm, 2 pins isolated, 1 pin grounded</td>
<td>18IS090, 18S, 5ISO90</td>
</tr>
<tr>
<td>D 0,50 mm²</td>
<td>B = UVB ( \lambda_{\text{max}} = 280 \text{ nm} ), ( \lambda_{\text{S10%}} = 231 \text{ nm} ) ... 309 nm</td>
<td>2-pin TO18 housing, h = 3,7 mm, 1 pin isolated, 1 pin grounded</td>
<td>18S</td>
</tr>
<tr>
<td>L 1,00 mm²</td>
<td>C = UVC ( \lambda_{\text{max}} = 275 \text{ nm} ), ( \lambda_{\text{S10%}} = 225 \text{ nm} ) ... 287 nm</td>
<td>2-pin TO5 housing, h = 4,3 mm for broadband, h = 6,7 mm for filtered UVA, UVB, UVC, UVI</td>
<td>5ISO90</td>
</tr>
<tr>
<td>XL 7,60 mm²</td>
<td>E = UV-Index spectral response according to CIE087</td>
<td>3-pin TO5 housing, h = 4,2 mm, 2 pins isolated, 1 pin grounded</td>
<td>nothing, Lens, MEGA, GIGA</td>
</tr>
</tbody>
</table>

Rev. 6.3 Due to our strive for continuous improvement, specifications are subject to change within our PCN policy according to JESD46C.
SG01S–C5
UVC-only SiC based UV photodiode A = 0,06 mm²

SPECIFICATIONS

<table>
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<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Value</th>
<th>Unit</th>
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<td>Spectral Characteristics</td>
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<tr>
<td>Typical Responsivity at Peak Wavelength</td>
<td>$S_{max}$</td>
<td>0,120</td>
<td>AW⁻¹</td>
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<tr>
<td>Wavelength of max. Spectral Responsivity</td>
<td>$\lambda_{max}$</td>
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<td>nm</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>
<tr>
<td>General Characteristics (T=25°C)</td>
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</tr>
<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>720</td>
<td>nA</td>
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<tr>
<td>Temperature Coefficient</td>
<td>$T_c$</td>
<td>$&lt;0,1$</td>
<td>%/K</td>
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<tr>
<td>Maximum Ratings</td>
<td></td>
<td></td>
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<tr>
<td>Operating Temperature</td>
<td>$T_{opt}$</td>
<td>–55 ... +170</td>
<td>°C</td>
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<tr>
<td>Storage Temperature</td>
<td>$T_{stor}$</td>
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<td>°C</td>
</tr>
<tr>
<td>Soldering Temperature (35)</td>
<td>$T_{sold}$</td>
<td>260</td>
<td>°C</td>
</tr>
<tr>
<td>Reverse Voltage</td>
<td>$V_{Rmax}$</td>
<td>20</td>
<td>V</td>
</tr>
</tbody>
</table>

NORMALIZED SPECTRAL RESPONSIVITY

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

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**SG01S–C5**

UVC-only SiC based UV photodiode $A = 0.06 \text{ mm}^2$

**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:
- $U_2 = \frac{1}{2} \times R_1 \times \frac{V}{A}$
- $U_{vpx}$ depends on load and amplifier type
- $R_1 = 10k \Omega$...
- $C_x = 3pF$
- Recommendation: $R_x \times C_x \geq 10 \text{ s}$
- $I_{vpx} = U_{vpx} \div R_1$
- Bandwidth = DC ...
- \[ \frac{1}{2 \times R_1 \times C_x} \]

Example:
- $I_1 = 20mA$, $R_1 = 100\Omega$, $C_x = 100 \mu F$
- $U_1 = 20 \times 10^6 \times 100 \times 10^{-6} = 2V$

**DRAWINGS**
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
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Industrial UV probes

- Different housings e.g. with cosine response, water pressure proof or sapphire windows
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- 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

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

APPLICATION NOTE FOR PHOTODIODES

SG01S–C5

UVC-only SiC based UV photodiode A = 0.06 mm²

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SG01S–C18
UVC-only SiC based UV photodiode A = 0,06 mm²

**GENERAL FEATURES**

**Properties of the SG01S–C18 UV photodiode**
- UVC-only sensitivity, compliant with DVGW W294, 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. 720 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**

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<tbody>
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<td><strong>18</strong> 2-pin TO18 housing, h = 5,2 mm, 1 pin isolated, 1 pin grounded</td>
<td><strong>nothing</strong>, <strong>Lens</strong>, <strong>MEGA</strong>, <strong>GIGA</strong></td>
</tr>
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<td><strong>M</strong> 0,20 mm²</td>
<td><strong>A</strong> = UVA</td>
<td><strong>18ISO90</strong> 3-pin TO18 housing, h = 5,2 mm, 2 pins isolated, 1 pin grounded</td>
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</tr>
<tr>
<td><strong>D</strong> 0,50 mm²</td>
<td><strong>B</strong> = UVB</td>
<td><strong>18S</strong> 2-pin TO18 housing, h = 3,7 mm, 1 pin isolated, 1 pin grounded</td>
<td></td>
</tr>
<tr>
<td><strong>L</strong> 1,00 mm²</td>
<td><strong>C</strong> = UVC</td>
<td><strong>5ISO90</strong> 3-pin TO5 housing, h = 4,2 mm, 2 pins isolated, 1 pin grounded</td>
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</tr>
<tr>
<td><strong>XL</strong> 7,60 mm²</td>
<td><strong>E</strong> = UV-Index</td>
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</table>

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Rev. 6.3 Due to our strive for continuous improvement, specifications are subject to change within our PCN policy according to JESD46C.
SG01S–C18
UVC-only SiC based UV photodiode A = 0,06 mm²

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<tr>
<td>Active Area</td>
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<td>0,06</td>
<td>mm$^2$</td>
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<td>Dark Current (1V reverse bias)</td>
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<td>Reverse Voltage</td>
<td>$V_{R_{\text{max}}}$</td>
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<td>V</td>
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NORMALIZED SPECTRAL RESPONSIVITY

Due to our strive for continuous improvement, specifications are subject to change within our PCN policy according to JESD46C.
**SG01S–C18**

UVC-only SiC based UV photodiode $A = 0.06 \text{ mm}^2$

### FIELD OF VIEW

![Graph showing field of view](image)

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

![Typical circuit diagram](image)

Calculations and Limits:
- $U_I = \frac{1}{R_x} \Rightarrow \theta \sim V_x$
- $U_{V,\text{line}}$ depends on load and amplifier type
- $R_x = 10 \Omega \sim 10 \text{G}\Omega$, $C_x = 3 \text{pF}$
- Recommendation: $R_x \cdot C_x \geq 10^{-3}$
- $I_{\text{line}} = U_{\text{line}} - U_{R}$
- Bandwidth = DC ... $\frac{1}{2 \pi \times R_x \times C_x}$

Example:
- $I_i = 20 \text{nA}$, $R_i = 100 \text{M}\Omega$, $C_i = 100 \text{ pF}$
- $U_i = 20 \times 10^3 \times 100 \times 10^{-2} = 2 \text{V}$

### DRAWINGS

![Drawing showing dimensions](image)

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*Rev. 6.3* Due to our strive for continuous improvement, specifications are subject to change within our PCN policy according to JESD46C.
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UPGRADE TO A TOCON OR A PROBE

TOCONs = UV sensors with integrated amplifier
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CALIBRATION SERVICE

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- Determination of a specific spectral sensor responsivity
**SG01XL–C5**

UVC-only SiC based UV photodiode A = 7.6 mm\(^2\)

**Properties of the SG01XL–C5 UV photodiode**
- UVC-only sensitivity, compliant with DVGW W294, PTB reported high chip stability
- Active Area A = 7.6 mm\(^2\)
- TO5 hermetically sealed metal housing, 1 isolated pin and 1 case pin
- 10\(\mu\)W/cm\(^2\) peak radiation results a current of approx. 91 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>Chip area</th>
<th>Spectral response</th>
<th>Housing</th>
<th>Special</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>S</strong> 0.06 mm(^2)</td>
<td>nothing = broad band</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><strong>M</strong> 0.20 mm(^2)</td>
<td>A = UVA, (\lambda_{\text{max}} = 331\text{ nm} ) (\lambda_{\text{S10%}} = 309\text{ nm} \ldots 367\text{ nm})</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/cm(^2)</td>
</tr>
<tr>
<td><strong>D</strong> 0.50 mm(^2)</td>
<td>B = UVB, (\lambda_{\text{max}} = 280\text{ nm} ) (\lambda_{\text{S10%}} = 231\text{ nm} \ldots 309\text{ nm})</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/cm(^2)</td>
</tr>
<tr>
<td><strong>L</strong> 1.00 mm(^2)</td>
<td>C = UVC, (\lambda_{\text{max}} = 275\text{ nm} ) (\lambda_{\text{S10%}} = 225\text{ nm} \ldots 287\text{ nm})</td>
<td>2-pin TO5 housing, h = 4.3 mm for broadband; h = 6.7 mm for filtered UVA, UVB, UVC, UVI</td>
<td></td>
</tr>
<tr>
<td><strong>XL</strong> 7.60 mm(^2)</td>
<td>E = UV-Index, spectral response according to CIE087</td>
<td>3-pin TO5 housing, h = 4.2 mm, 2 pins isolated, 1 pin grounded</td>
<td></td>
</tr>
</tbody>
</table>

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SG01XL–C5
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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><strong>Maximum Ratings</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<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 (3s)</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>
<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>7,6</td>
<td>mm²</td>
</tr>
<tr>
<td>Dark Current (1V reverse bias)</td>
<td>Id</td>
<td>25,3</td>
<td>fA</td>
</tr>
<tr>
<td>Capacitance</td>
<td>C</td>
<td>1900</td>
<td>pF</td>
</tr>
<tr>
<td>Short Circuit (10µW/cm² at peak)</td>
<td>Io</td>
<td>91</td>
<td>nA</td>
</tr>
<tr>
<td>Temperature Coefficient</td>
<td>Tc</td>
<td>&lt; −0,1</td>
<td>%/K</td>
</tr>
<tr>
<td><strong>Spectral Characteristics</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spectral Responsivity at Peak Wavelength</td>
<td>Smax</td>
<td>0,120 (+ −10%)</td>
<td>AW⁻¹</td>
</tr>
<tr>
<td>Wavelength of max. Spectral Responsivity</td>
<td>λmax</td>
<td>275</td>
<td>nm</td>
</tr>
<tr>
<td>Responsivity Range (S=0,1*Smax)</td>
<td>–</td>
<td>225 ... 287</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>

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NORMALIZED SPECTRAL RESPONSIVITY
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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

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**TYPICAL CIRCUIT**

![Typical Circuit Diagram]

Calculations and Limits:
- $U_s = I_l \times R_l \rightarrow 0 \cdots \sim V_a$
- $U_{vem}$ depends on load and amplifier type
- $R_l = 10k\Omega \cdots \sim 10\Omega$, $C = 3\text{pF}$
- Recommendation: $R_l \times C \geq 10 \text{s}$
- $\Delta U_{vem} = U_{vem} + R_l$
- Bandwidth = DC ...

$$\frac{1}{2\pi \times R_l \times C}$$

Example:
- $I_l = 20nA$, $R_l = 100\Omega$, $C = 100 \text{pF}$
- $U_s = 20 \times 10^9 \times 100 \times 10^5[\text{rad}] = 2V$

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**DRAWINGS**

![Photodiode Perspective Drawings]

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