SG01M–A5
UVA-only SiC based UV photodiode A = 0,20 mm²

GENERAL FEATURES

Properties of the SG01M–A5 UV photodiode
- UVA-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. 740 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 five different active chip areas from 0,06 mm² up to 4,00 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, M, D, L, XL</td>
<td>nothing, A, B, C or E</td>
<td>S, M, D, L, XL</td>
<td>nothing, Lens, MEGA, GIGA</td>
</tr>
<tr>
<td>S 0,06 mm²</td>
<td>nothing = broadband</td>
<td>λₘₐₓ = 280 nm</td>
<td>λ₃₅₀% = 221 nm ... 358 nm</td>
</tr>
<tr>
<td>M 0,20 mm²</td>
<td>A = UVA</td>
<td>λₘₐₓ = 331 nm</td>
<td>λ₃₅₀% = 309 nm ... 367 nm</td>
</tr>
<tr>
<td>D 0,50 mm²</td>
<td>B = UVB</td>
<td>λₘₐₓ = 280 nm</td>
<td>λ₃₅₀% = 231 nm ... 309 nm</td>
</tr>
<tr>
<td>L 1,00 mm²</td>
<td>C = UVC</td>
<td>λₘₐₓ = 275 nm</td>
<td>λ₃₅₀% = 225 nm ... 287 nm</td>
</tr>
<tr>
<td>XL 4,00 mm²</td>
<td>E = UV-Index</td>
<td>spectral response according to CIE087</td>
<td>λₘₐₓ = 340 nm</td>
</tr>
</tbody>
</table>

Rev. 6.0 Due to our strive for continuous improvement, specifications are subject to change within our PCN policy according to JESD46C.
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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>0,037</td>
<td>AW⁻¹</td>
</tr>
<tr>
<td>Wavelength of max. Spectral Responsivity</td>
<td>$\lambda_{\text{max}}$</td>
<td>331</td>
<td>nm</td>
</tr>
<tr>
<td>Responsivity Range ($S=0,1*S_{\text{max}}$)</td>
<td>–</td>
<td>309 ... 367</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>0,20</td>
<td>mm²</td>
</tr>
<tr>
<td>Dark Current (1V reverse bias)</td>
<td>$I_d$</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>$I_o$</td>
<td>740</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 (3s)</td>
<td>$T_{\text{sold}}$</td>
<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](image)

Spectral Characteristics

- Typical Responsivity at Peak Wavelength: $S_{\text{max}} = 0.037$ AW⁻¹
- Wavelength of max. Spectral Responsivity: $\lambda_{\text{max}} = 331$ nm
- Responsivity Range: $S=0.1*S_{\text{max}}$ (309 to 367 nm)
- Visible Blindness: $S_{\text{max}}/S_{>405nm} > 10^{10}$

General Characteristics (T=25°C)

- Active Area: $A = 0.20$ mm²
- Dark Current: $I_d = 0.7$ fA
- Capacitance: $C = 50$ pF
- Short Circuit: $I_o = 740$ 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 (3s): $T_{\text{sold}} = 260$ °C
- Reverse Voltage: $V_{\text{Rmax}} = 20$ V

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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:
\[ U_i = I_x R_i \rightarrow 0 \rightarrow U_x \]
\[ U_{x_{\text{min}}} = \text{depends on load and amplifier type} \]
\[ R_i = 100\Omega \rightarrow 10G\Omega, C_i = 3pF \]
Recommendation: \( R_x C_x \geq 10^{-9}s \)
\[ I_{x_{\text{min}}} = U_{x_{\text{min}}} + R_i \]
Bandwidth = DC \( \frac{1}{2 \pi R_x C_x} \)
Example:
\[ I_x = 20\mu A, R_i = 100\Omega, C_i = 100\ pF \]
\[ U_x = 20 \times 10^{-9} \times 100 \times 10^{-10} = 2\ V \]

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