



Boston Electronics Corporation

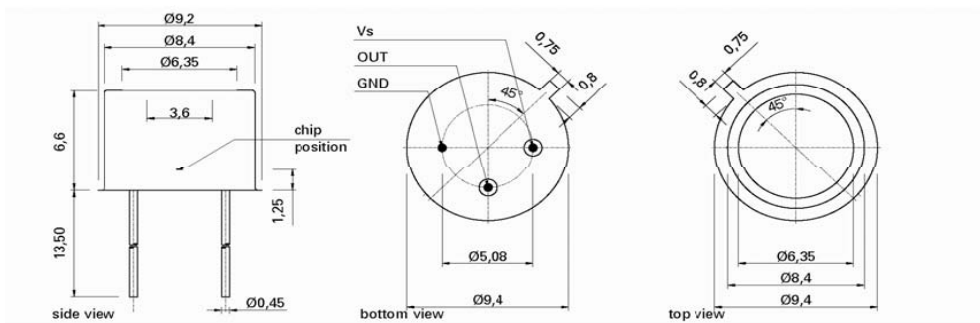
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TOCON-Series Summary

The TOCON series are SiC UV photodiodes in TO-39 packages with hybrid preamplifiers inside. **The customer need only provide power and a read-out.**

They are available in a wide range of sensitivities corresponding to a wide range of potential customer requirements. Output is 0 to 5V. If 10 mV is the lower end of useful output, dynamic range is 500:1 in any one device.

Input is 5 VDC.



Model	Optical input, Watts/cm ² , for 10 mV output	Optical input, Watts/cm ² , for 1 V output	at wavelength (nm)
TOCON_nano	1.0E-09	1.0E-07	280
TOCON_micro	1.0E-07	1.0E-05	280
TOCON_sun	1.0E-05	1.0E-03	Broadband, solar
TOCON_standard	5.0E-05	5.0E-03	280
TOCON_standard_C	2.5E-06	2.5E-04	254
TOCON_kilo_C	1.4E-05	1.4E-03	254
TOCON_mega	2.0E-03	2.0E-01	280
TOCON_giga	2.5E-02	2.5E+00	280
TOCON_giga_A	3.3E-02	3.3E+00	335
Intermediate values are available on request			

Per CIE087 and DIN5050, 1 UVI input produces electrical output (mV)		
TOCON_ERYCA	80 mV	Broadband, solar

Accessories	
TOCON_probe	miniature housing with TOCON installed and 5-pin connector
Cable	mating Binder 5-pin cable, various lengths available

General Features



Properties of the TOCON_nano

- Broad Band pre-amplified UV photodetector for very low radiation
- Sensitive area $A = 12.80\text{mm}^2$, 0.22 mm^2 SiC detector chip
- Applications: flame control and other low radiation measurements
- 1nW/cm^2 peak radiation results a voltage of approx. 280 mV
- Replacement for obsolete component Perkin Elmer UV10.T2E.10L

The TOCON pre-amplified UV photodetectors

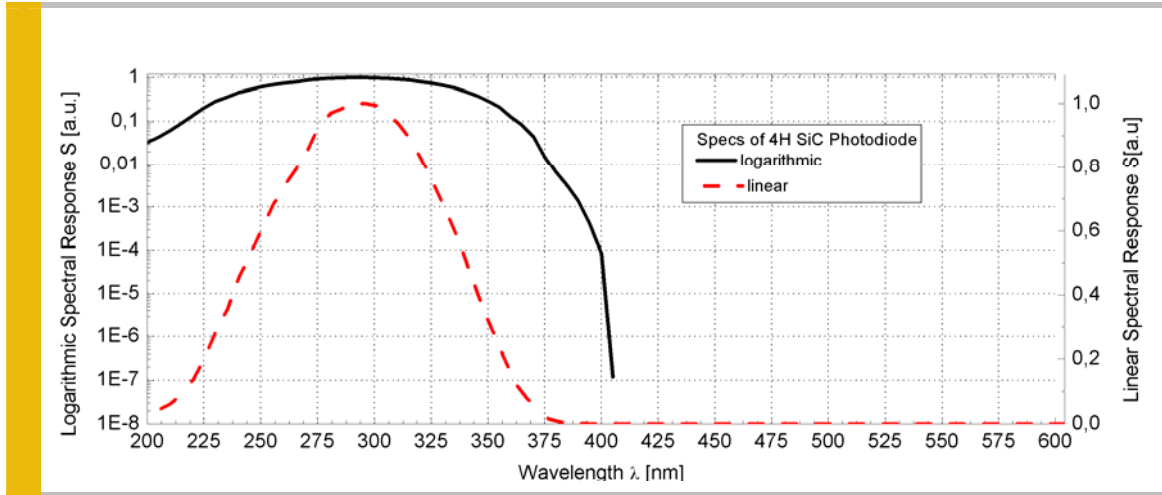
The TOCON devices are using modern hybride technology to cancel unwanted signal disturbances caused by moisture or electromagnetic radiation. The stable 0-5V output voltage can be directly connected to a SPC controller or a voltage multimeter.

Specifications

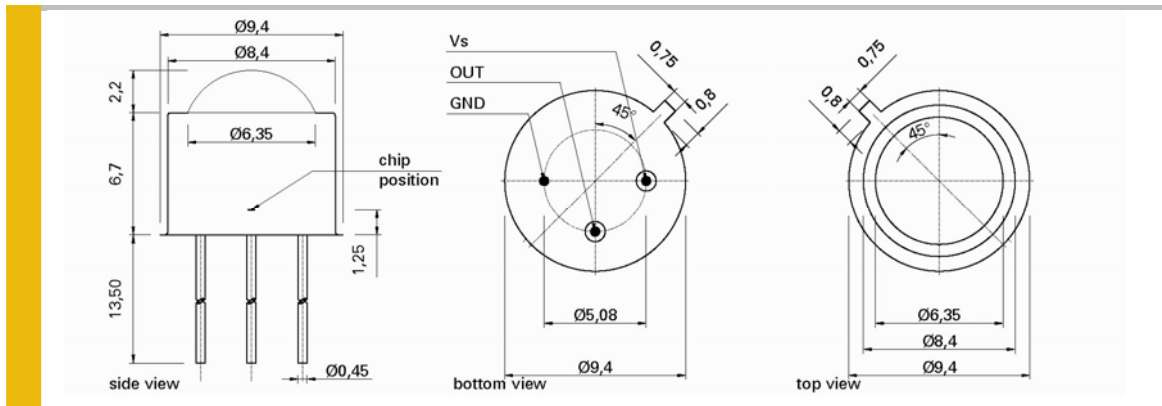
Parameter	Symbol	Value	Unit
Maximum Ratings			
Operating Temperature Range	T_{opt}	-25 - +85	°C
Storage Temperature Range	T_{stor}	-40 - +100	°C
Soldering Temperature (3s)	T_{sold}	300	°C
General Characteristics (T=25°C)			
Sensitive area	A_{sens}	12.80	mm^2
Chip area	A_{chip}	0.22	mm^2
Supply voltage	V_{supply}	2.5 - 5.0	V
max. voltage	V_{max}	5.5	V
saturation voltage	V_{sat}	5.0	V
dark offset voltage	V_{offset}	0.5	mV
Temperature coefficient	T_C	<-0.3	%/K
Current	I	0.8	mA
Bandwidth (-3 dB)	Θ	15	Hz
risetime (63%)	t_{rise}	10	ms
Spectral Characteristics (T=25°C)			
Sensitivity at peak	S_{max}	280	mV/nW/cm^2
Wavelength of max. spectral sens.	λ_{max}	280	nm
Sensitivity range (S=0,1*S _{max})	-	210 - 380	nm

Visible blindness ($S_{max} / S_{>400nm}$)	VB	10^{10}	-
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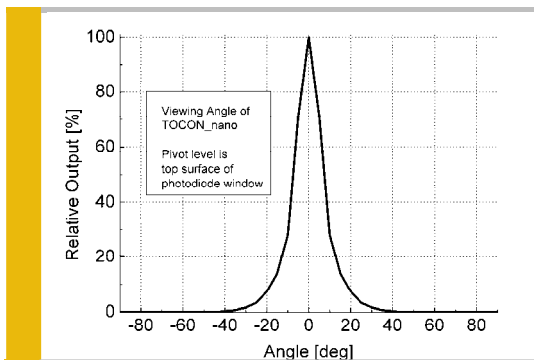
Spectral Response



Drawing



Viewing Angle



General Features



Properties of the TOCON_micro

- Broad Band pre-amplified UV detector for low level radiation
- 0,22 mm² SiC detector chip with cosine correction
- Applications: scientific experiments, gas transmission analysis
- 10 μW/cm² peak radiation results a voltage of approx. 2 V

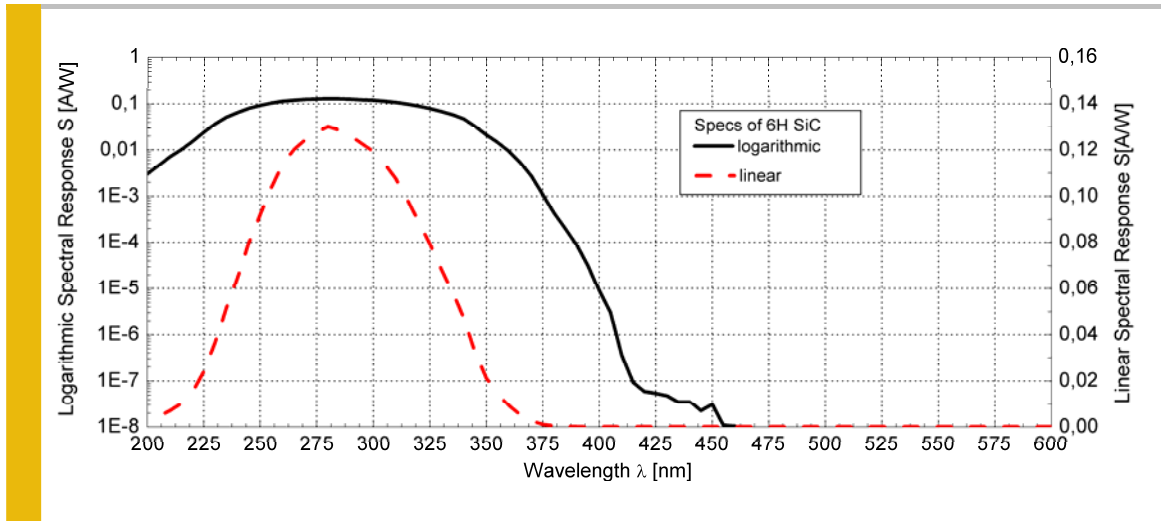
The TOCON pre-amplified UV photodetectors

The TOCON devices are using modern hybride technology to cancel unwanted signal disturbances caused by moisture or electromagnetic radiation. The stable 0...5V output voltage can be directly connected to a SPC controller or a voltage multimeter.

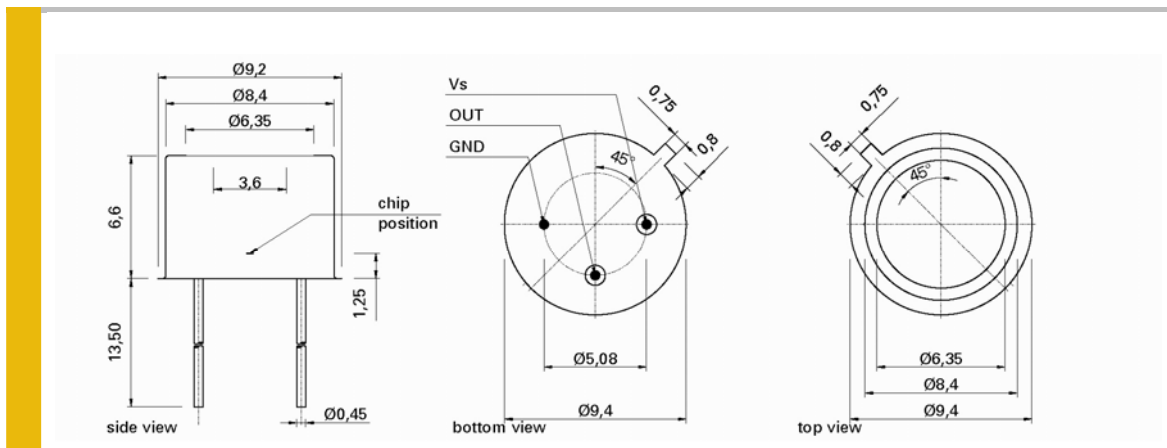
Specifications

Parameter	Symbol	Value	Unit
Maximum Ratings			
Operating Temperature Range	T_{opt}	-25 ... +85	°C
Storage Temperature Range	T_{stor}	-40 ... +100	°C
Soldering Temperature (3s)	T_{sold}	300	°C
General Characteristics (T=25°C)			
Chip area	A_{chip}	0,22	mm ²
Supply voltage	V_{supply}	2,5 ... 5,0	V
max. voltage	V_{max}	5,5	V
saturation voltage	V_{sat}	5,0	V
dark offset voltage	V_{offset}	0,5	mV
Temperature coefficient	Tc	<-0,3	%/K
Current	I	0,8	mA
Bandwidth (-3 dB)	θ	15	Hz
risetime (63%)	t_{rise}	10	ms
Spectral Characteristics (T=25°C)			
Sensitivity at peak	S_{max}	200	mV/μW/cm ²
Wavelength of max. spectral sens.	λ_{max}	280	nm
Sensitivity range (S=0,1*S _{max})	-	210 ... 380	nm
Visible blindness (S _{max} / S _{>400nm})	VB	10 ⁵	-

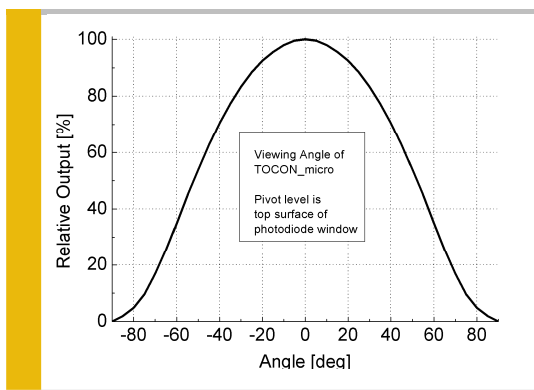
Spectral Response



Drawing



Viewing Angle



General Features



Properties of the TOCON_sun

- Broad Band pre-amplified UV detector for sun UV level radiation
- 0,22 mm² SiC detector chip with cosine correction
- Applications: measurement of the sun's total UV irradiance or artificial light, similar to the sun's radiation
- 1 mW/cm² peak radiation results a voltage of approx. 1 V

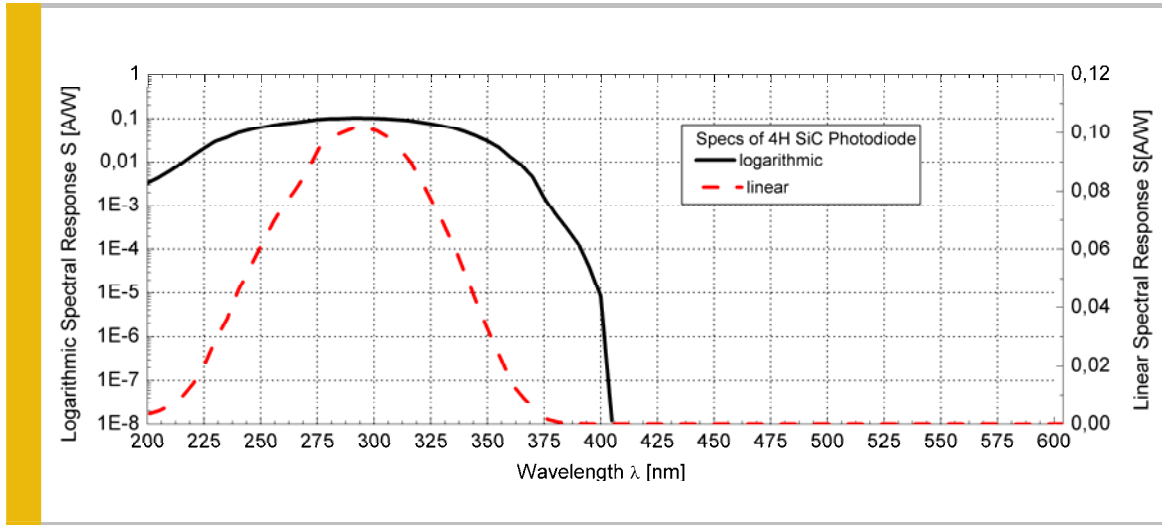
The TOCON pre-amplified UV photodetectors

The TOCON devices are using modern hybride technology to cancel unwanted signal disturbances caused by moisture or electromagnetic radiation. The stable 0...5V output voltage can be directly connected to a SPC controller or a voltage multimeter.

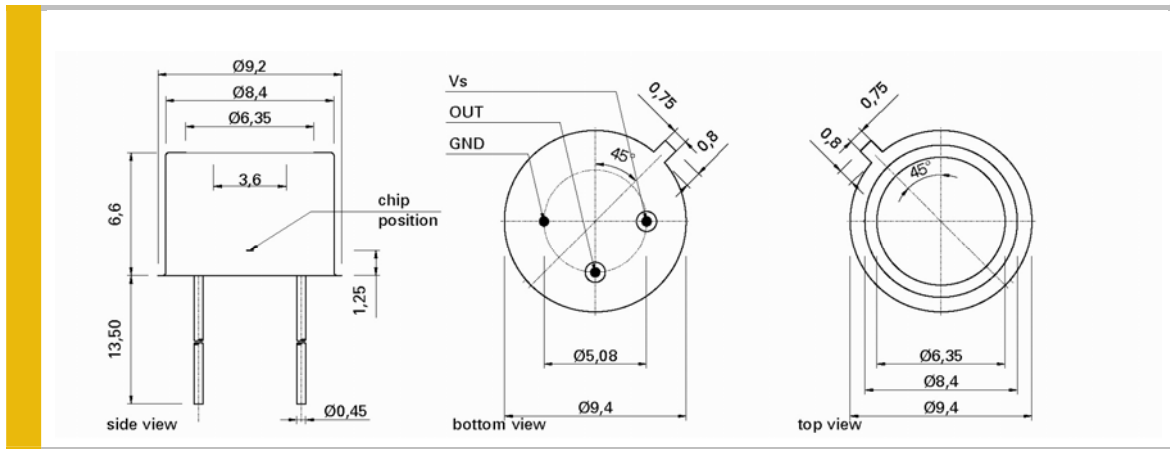
Specifications

Parameter	Symbol	Value	Unit
Maximum Ratings			
Operating Temperature Range	T_{opt}	-25 ... +85	°C
Storage Temperature Range	T_{stor}	-40 ... +100	°C
Soldering Temperature (3s)	T_{sold}	300	°C
General Characteristics (T=25°C)			
Chip area	A_{chip}	0,22	mm ²
Supply voltage	V_{supply}	2,5 ... 5,0	V
max. voltage	V_{max}	5,5	V
saturation voltage	V_{sat}	5,0	V
dark offset voltage	V_{offset}	0,5	mV
Temperature coefficient	Tc	<-0,3	%/K
Current	I	0,8	mA
Bandwidth (-3 dB)	Θ	15	Hz
risetime (63%)	t_{rise}	10	ms
Spectral Characteristics (T=25°C)			
Sensitivity at peak	S_{max}	1000	mV/mW/cm ²
Wavelength of max. spectral sens.	λ_{max}	280	nm
Sensitivity range ($S=0,1 \cdot S_{max}$)	-	210 ... 380	nm
Visible blindness ($S_{max} / S_{>400nm}$)	VB	>10 ¹⁰	-

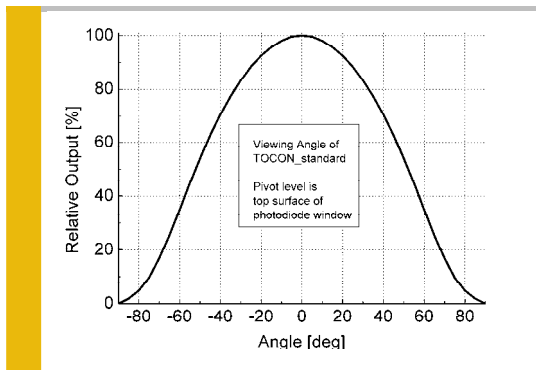
Spectral Response



Drawing



Viewing Angle



General Features



Properties of the TOCON_ERYCA

- Pre-amplified UV detector for UV-Index measurements
- 0,22 mm² SiC detector chip with cosine correction
- DIN5050/ CIE087 UVI measurement with very small error $<\pm 3\%$
- 1 UVI result a voltage of approx. 80 mV

The TOCON pre-amplified UV photodetectors

The TOCON devices are using modern hybride technology to cancel unwanted signal disturbances caused by moisture or electromagnetic radiation. The stable 0...5V output voltage can be directly connected to a SPC controller or a voltage multimeter.

Information about the UV-Index (UVI)

The UV index is an international standard measurement of how strong the ultraviolet (UV) radiation from the sun is at a particular place on a particular day. It is a scale primarily used in daily forecasts aimed at the general public. The UV-Index is calculated by integrating the sun's UV spectrum multiplied with the Erythema action curve (fig. 1, black curve and fig. 2, formula 1). That integral is divided by 25 mW/m² to generate a convenient index value, which becomes essentially a scale of 0 to 10. The Erythema action curve is a wavelength resolved measure of the sunburn danger. It is maximised at 297nm (UVB) and then strongly decreases towards UVA radiation. Literature: A. F. McKinlay and B. L. Diffey, "A reference action spectrum for ultraviolet induced erythema in human skin" CIE Journal, 6-1, 17-22 (1987)

About the sglux ERYCA sensors

The ERYCA is designed for accurate measurement of the UV-Index. ERYCA's error is $<3\%$ only which is sufficiently small for scientific and high performance commercial applications.

How ERYCA's $<3\%$ error is calculated?

A good erythema sensor's response needs to follow the Erythema Action curve (fig 1) as close as possible. Additionally the visible blindness needs to be extremely high as the visible part of sun's radiation exceeds the erythema causing radiation by five orders of magnitude. ERYCA works with a 4H SiC detector chip providing a visible blindness of more than ten orders of magnitude. That means that absolutely no visible light interferes the sensors output value. Sensors with a visible blindness of less than six orders of magnitude are unsuited for UVI measurement even if they match with the CIE curve. ERYCA's curve (fig. 1, red curve) has a near perfect match from 295nm to 320nm. From 320nm a leakage of approx. 0,1% is seen. To find out how that leakage negatively influences the UVI measurement a closer look at different sun spectra (varying tilt angle and ozone layer thickness) is needed. Fig. 4 shows different sun UV spectra issued by the Swiss governmental institute of meteorology. In total nine different sun spectra calculating an UVI from 1,12 to 10,92 were used. For error calculation the different sun spectra were integrated with the Erythema action curve and subsequently the integral of the same spectra with ERYCA's response curve (fig. 2, formula 1 and 2) were calculated. Finally the error was calculated by using formula 3 (fig. 2). As shown by the blue curve (fig. 3) the error of all UVI is less than 3%.

Fig. 1 Spectral Response

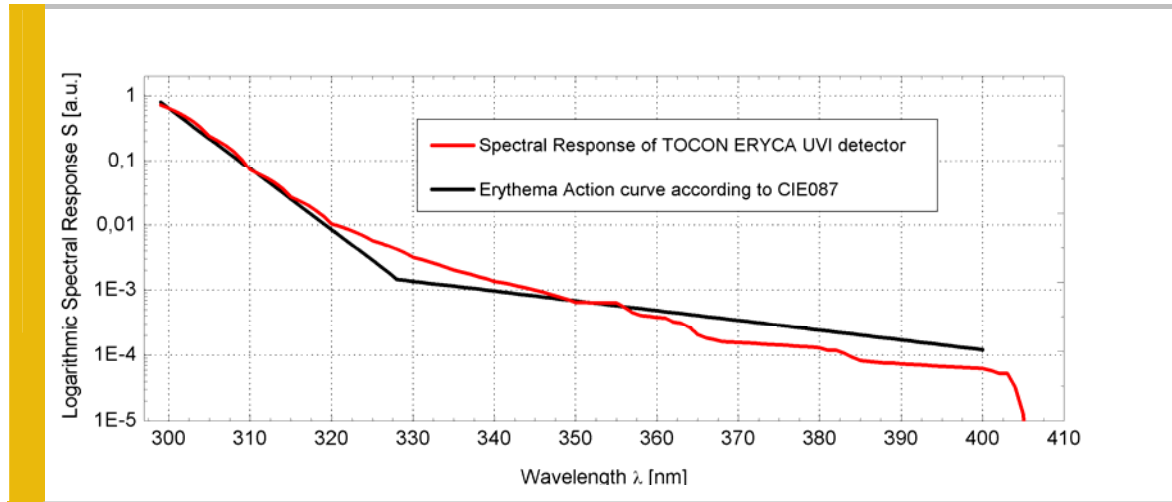


Fig. 2 Calculation Formulae

$$UVI_{ideal} = \int_{\lambda=297\text{ nm}}^{\lambda=400\text{ nm}} \frac{S(\lambda) \cdot CIE(\lambda)}{25\text{mW/m}^2} d\lambda \quad (1)$$

$$UVI_{real} = \int_{\lambda=297\text{ nm}}^{\lambda=400\text{ nm}} \frac{S(\lambda) \cdot ERYCA(\lambda)}{25\text{mW/m}^2} d\lambda \quad (2)$$

$$E = \frac{(UVI_{ideal} - UVI_{real}) \cdot 100}{UVI_{ideal}} \quad (3)$$

Legend
 $S(\lambda)$ = sun UV spectrum
 $CIE(\lambda)$ = CIE087 standard curve
 $ERYCA(\lambda)$ = ERYCA response curve
 E = error in %

Fig. 3 Error Graph

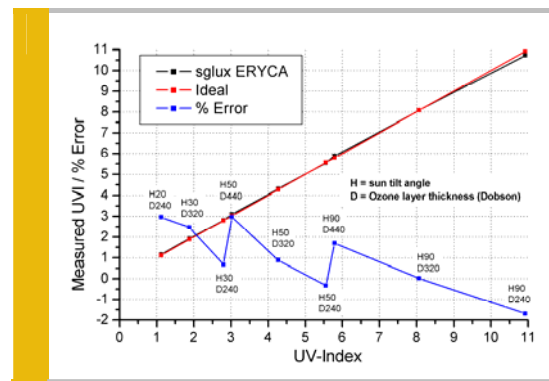


Fig. 4 Sun Spectra Issued by the Swiss Meteo Institute

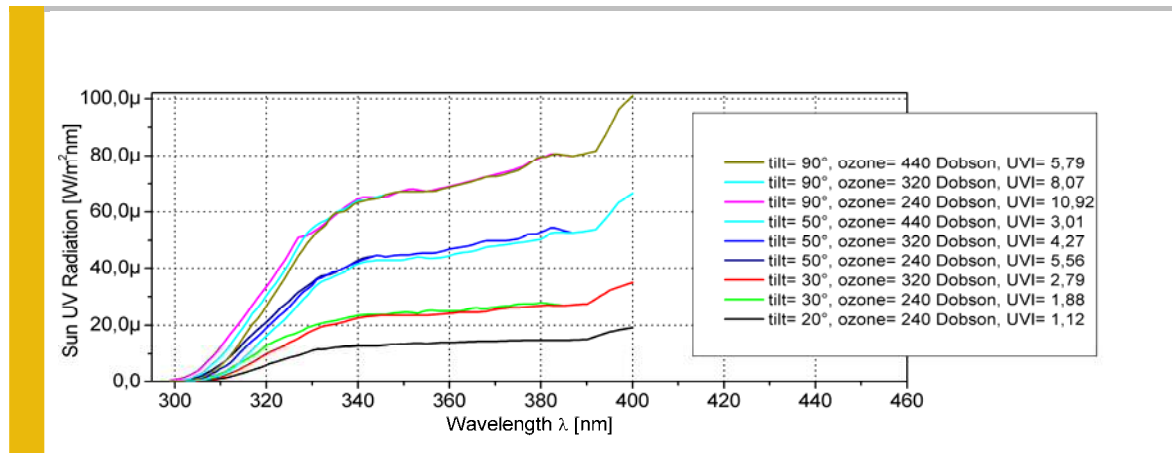


Fig. 5 Specifications

Parameter	Symbol	Value	Unit
Maximum Ratings			
Operating Temperature Range	T_{opt}	-25 ... +85	°C
Storage Temperature Range	T_{stor}	-40 ... +100	°C
Soldering Temperature (3s)	T_{sold}	300	°C
General Characteristics (T=25°C)			
Chip area	A_{chip}	0,22	mm ²
Supply voltage	V_{supply}	2,5 ... 5,0	V
max. voltage	V_{max}	5,5	V
saturation voltage	V_{sat}	5,0	V
dark offset voltage	V_{offset}	0,5	mV
Temperature coefficient	Tc	<-0,3	%/K
Current	I	0,8	mA
Bandwidth (-3 dB)	θ	15	Hz
risetime (63%)	t_{rise}	10	ms
Spectral Characteristics (T=25°C)			
Sensitivity at AM 1.5 sun spectrum	S_{max}	80	mV/UVI
Visible blindness ($S_{max} / S_{>400nm}$)	VB	$>10^{10}$	-

Fig. 6 Drawing

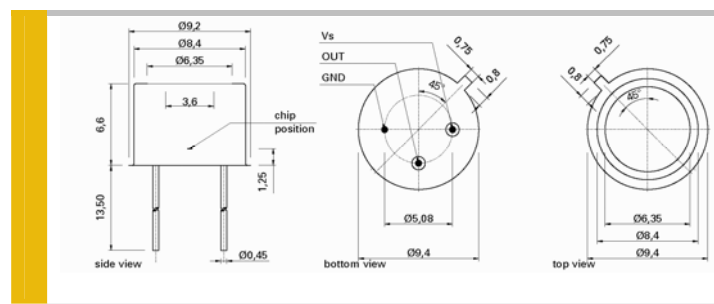
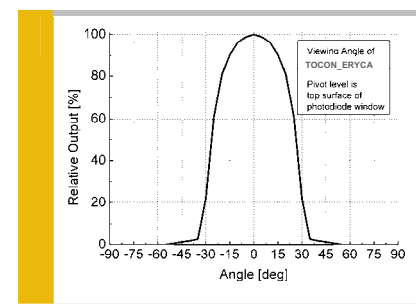


Fig. 7 Viewing Angle



General Features



Properties of the TOCON_standard

- Broad Band pre-amplified UV detector for standard level radiation
- 0,22 mm² SiC detector chip with cosine correction
- Applications: purification control, scientific experiments
- 10 mW/cm² peak radiation results a voltage of approx. 2 V

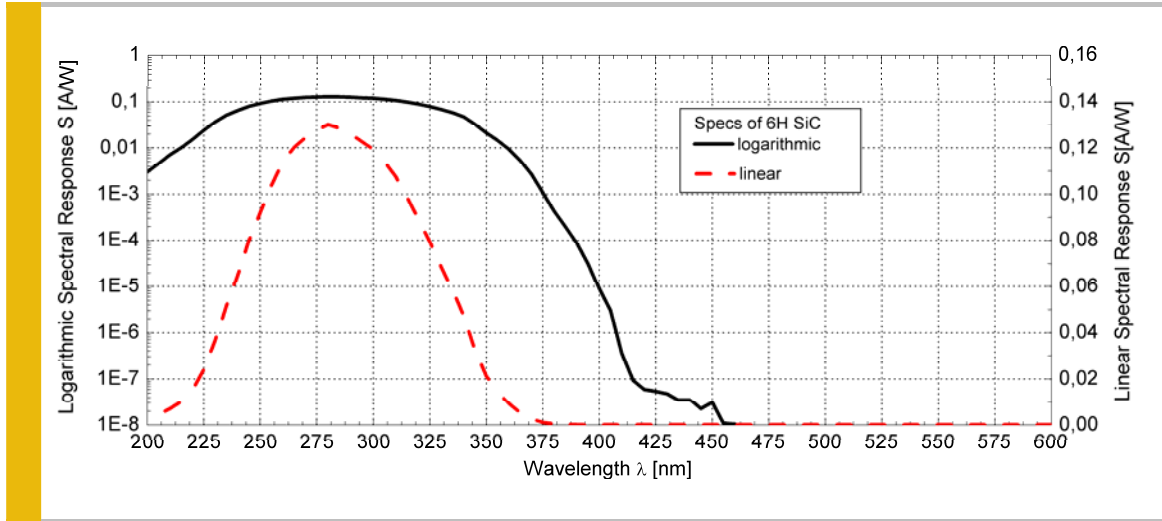
The TOCON pre-amplified UV photodetectors

The TOCON devices are using modern hybride technology to cancel unwanted signal disturbances caused by moisture or electromagnetic radiation. The stable 0...5V output voltage can be directly connected to a SPC controller or a voltage multimeter.

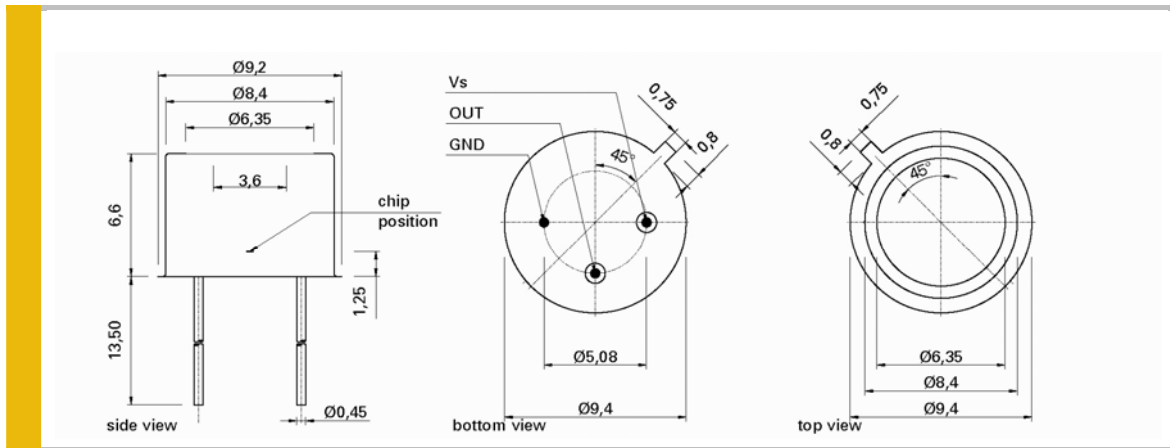
Specifications

Parameter	Symbol	Value	Unit
Maximum Ratings			
Operating Temperature Range	T_{opt}	-25 ... +85	°C
Storage Temperature Range	T_{stor}	-40 ... +100	°C
Soldering Temperature (3s)	T_{sold}	300	°C
General Characteristics (T=25°C)			
Chip area	A_{chip}	0,22	mm ²
Supply voltage	V_{supply}	2,5 ... 5,0	V
max. voltage	V_{max}	5,5	V
saturation voltage	V_{sat}	5,0	V
dark offset voltage	V_{offset}	0,5	mV
Temperature coefficient	Tc	<-0,3	%/K
Current	I	0,8	mA
Bandwidth (-3 dB)	Θ	15	Hz
risetime (63%)	t_{rise}	10	ms
Spectral Characteristics (T=25°C)			
Sensitivity at peak	S_{max}	200	mV/mW/cm ²
Wavelength of max. spectral sens.	λ_{max}	280	nm
Sensitivity range ($S=0,1 \cdot S_{max}$)	-	210 ... 380	nm
Visible blindness ($S_{max} / S_{>400nm}$)	VB	10^5	-

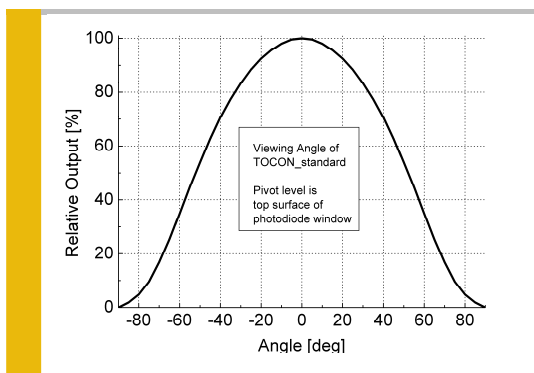
Spectral Response



Drawing



Viewing Angle



General Features



Properties of the TOCON_standard_C

- Pre-amplified UVC detector for medium radiation
- 0,22 mm² SiC detector chip with cosine correction
- Applications: purification control
- 0,5 mW/cm² radiation at 254nm results a voltage of approx. 2 V

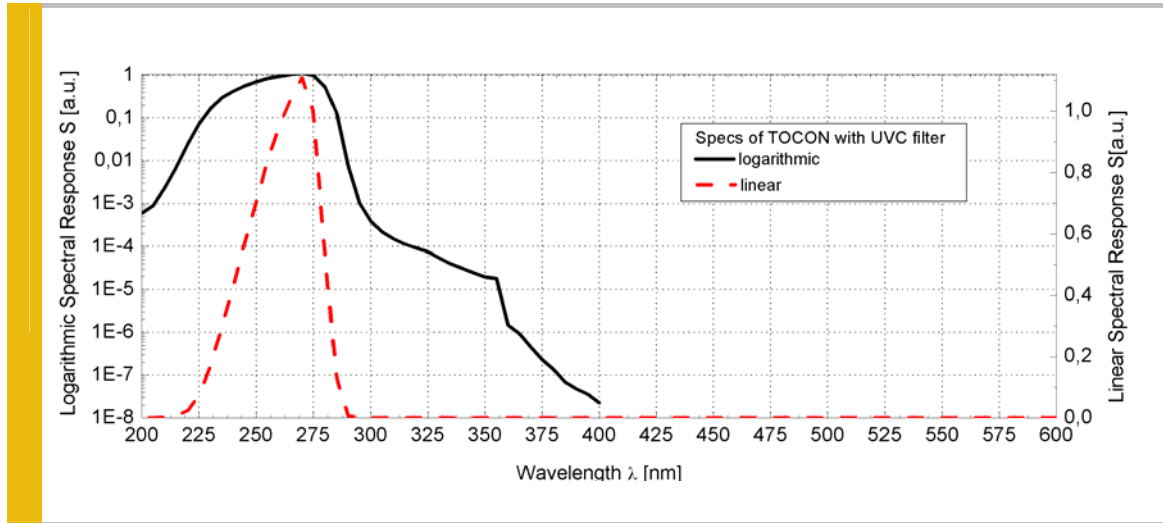
The TOCON pre-amplified UV photodetectors

The TOCON devices are using modern hybride technology to cancel unwanted signal disturbances caused by moisture or electromagnetic radiation. The stable 0...5V output voltage can be directly connected to a SPC controller or a voltage multimeter.

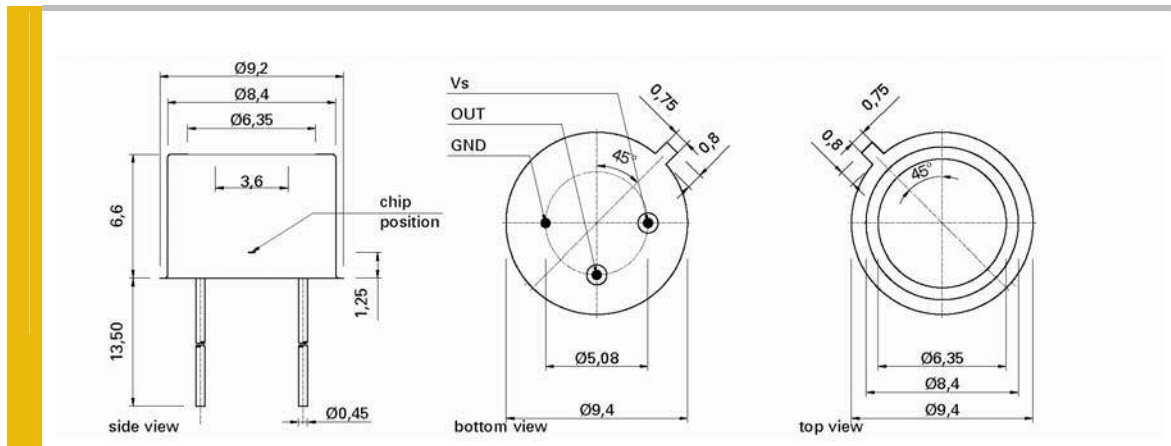
Specifications

Parameter	Symbol	Value	Unit
Maximum Ratings			
Operating Temperature Range	T_{opt}	-25 ... +85	°C
Storage Temperature Range	T_{stor}	-40 ... +100	°C
Soldering Temperature (3s)	T_{sold}	300	°C
General Characteristics (T=25°C)			
Chip area	A_{chip}	0,22	mm ²
Supply voltage	V_{supply}	2,5 ... 5,0	V
max. voltage	V_{max}	5,5	V
saturation voltage	V_{sat}	5,0	V
dark offset voltage	V_{offset}	0,5	mV
Temperature coefficient	Tc	<-0,3	%/K
Current	I	0,8	mA
Bandwidth (-3 dB)	θ	15	Hz
risetime (63%)	t_{rise}	10	ms
Spectral Characteristics (T=25°C)			
Sensitivity at 254nm	S_{max}	4	V/mW/cm ²
Wavelength of max. spectral sens.	λ_{max}	270	nm
Sensitivity range (S=0,1*S _{max})	-	230 ... 285	nm
Visible blindness (S _{max} / S _{>400nm})	VB	>10 ¹⁰	-

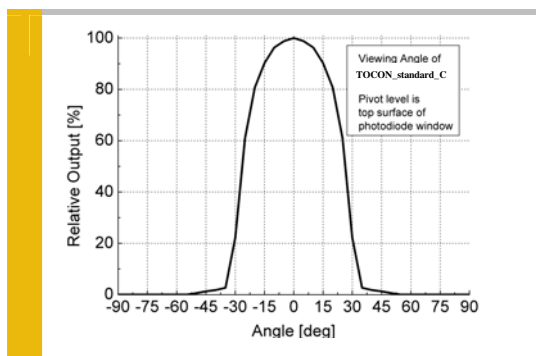
Spectral Response



Drawing



Viewing Angle



General Features



Properties of the TOCON_kilo_C

- Pre-amplified UVC detector for medium radiation
- 0,22 mm² SiC detector chip with cosine correction
- Applications: purification control
- 2,7 mW/cm² radiation at 254nm results a voltage of approx. 2 V

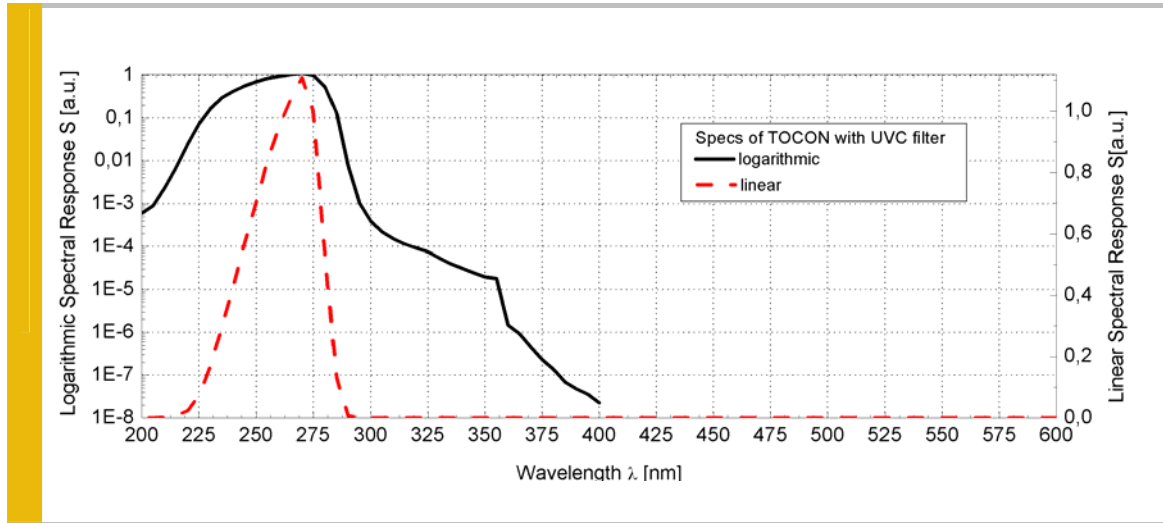
The TOCON pre-amplified UV photodetectors

The TOCON devices are using modern hybride technology to cancel unwanted signal disturbances caused by moisture or electromagnetic radiation. The stable 0...5V output voltage can be directly connected to a SPC controller or a voltage multimeter.

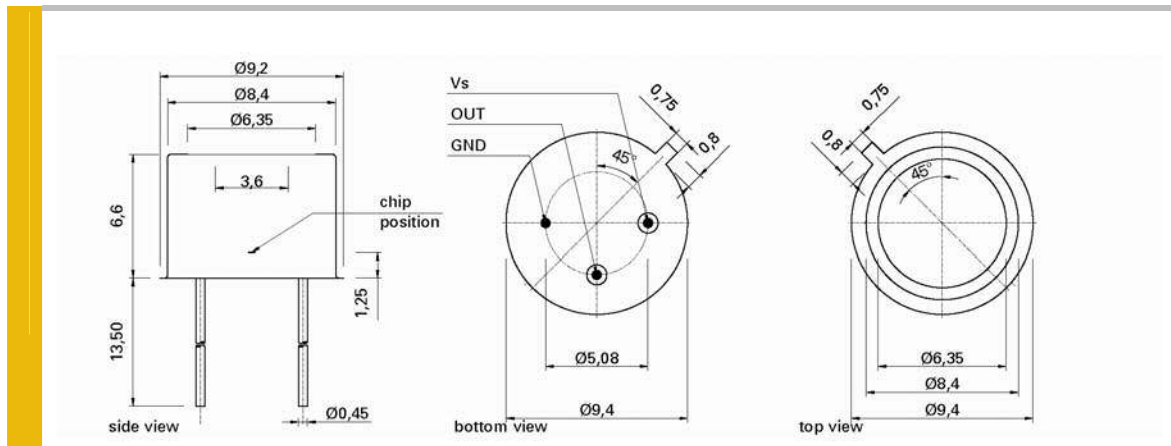
Specifications

Parameter	Symbol	Value	Unit
Maximum Ratings			
Operating Temperature Range	T_{opt}	-25 ... +85	°C
Storage Temperature Range	T_{stor}	-40 ... +100	°C
Soldering Temperature (3s)	T_{sold}	300	°C
General Characteristics (T=25°C)			
Chip area	A_{chip}	0,22	mm ²
Supply voltage	V_{supply}	2,5 ... 5,0	V
max. voltage	V_{max}	5,5	V
saturation voltage	V_{sat}	5,0	V
dark offset voltage	V_{offset}	0,5	mV
Temperature coefficient	Tc	<-0,3	%/K
Current	I	0,8	mA
Bandwidth (-3 dB)	θ	15	Hz
risetime (63%)	t_{rise}	10	ms
Spectral Characteristics (T=25°C)			
Sensitivity at 254nm	S_{max}	0,73	V/mW/cm ²
Wavelength of max. spectral sens.	λ_{max}	270	nm
Sensitivity range (S=0,1*S _{max})	-	230 ... 285	nm
Visible blindness (S _{max} / S _{>400nm})	VB	>10 ¹⁰	-

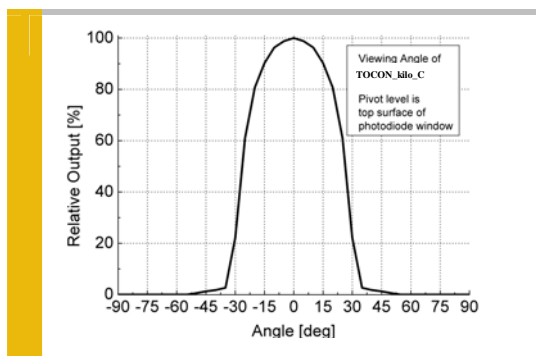
Spectral Response



Drawing



Viewing Angle



General Features



Properties of the TOCON_mega

- Broad Band pre-amplified UV detector for very strong radiation
- radiation hard steel attenuating mesh for long term stability
- Applications: UV hardening control & other high radiation sources
- 0,1W/cm² peak radiation results a voltage of approx. 500 mV

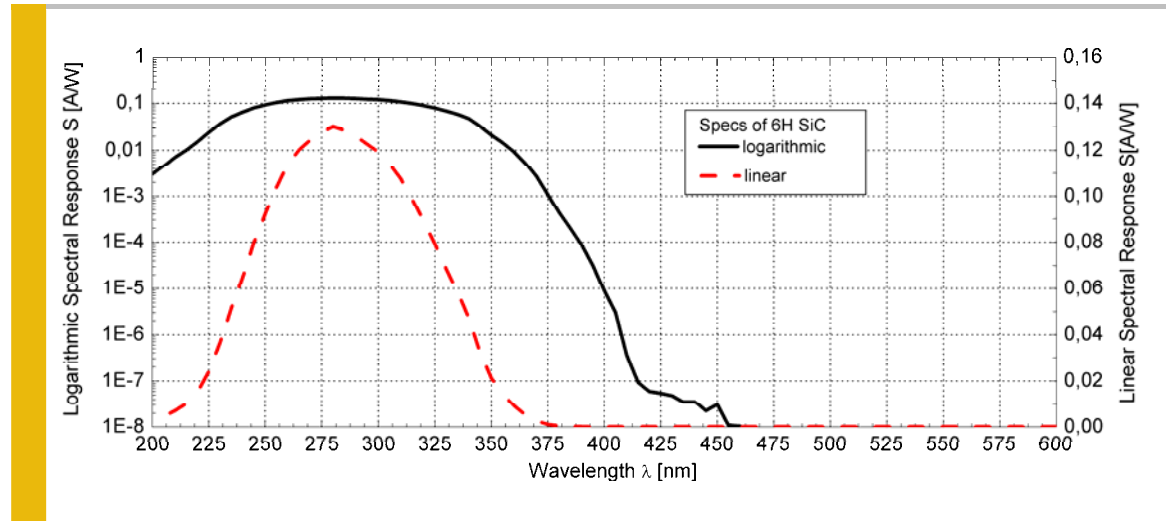
The TOCON pre-amplified UV photodetectors

The TOCON devices are using modern hybride technology to cancel unwanted signal disturbances caused by moisture or electromagnetic radiation. The stable 0...5V output voltage can be directly connected to a SPC controller or a voltage multimeter.

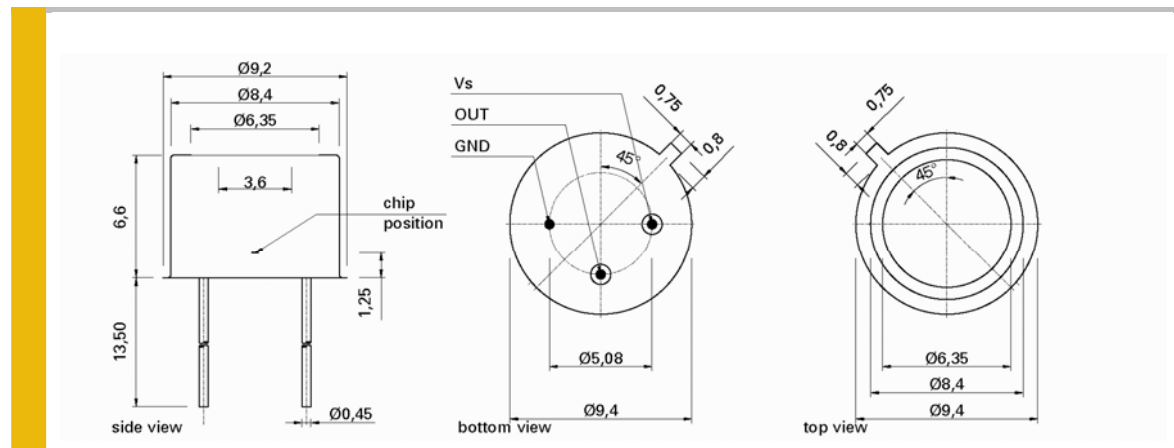
Specifications

Parameter	Symbol	Value	Unit
Maximum Ratings			
Operating Temperature Range	T_{opt}	-25 ... +85	°C
Storage Temperature Range	T_{stor}	-40 ... +100	°C
Soldering Temperature (3s)	T_{sold}	300	°C
General Characteristics (T=25°C)			
Chip area	A_{chip}	0,22	mm ²
Supply voltage	V_{supply}	2,5 ... 5,0	V
max. voltage	V_{max}	5,5	V
saturation voltage	V_{sat}	5,0	V
dark offset voltage	V_{offset}	0,5	mV
Temperature coefficient	Tc	<-0,3	%/K
Current	I	0,8	mA
Bandwidth (-3 dB)	θ	15	Hz
risetime (63%)	t_{rise}	10	ms
Spectral Characteristics (T=25°C)			
Sensitivity at peak	S_{max}	5	V/W/cm ²
Wavelength of max. spectral sens.	λ_{max}	280	nm
Sensitivity range (S=0,1*S _{max})	-	210 ... 380	nm
Visible blindness (S _{max} / S _{>400nm})	VB	10 ⁵	-

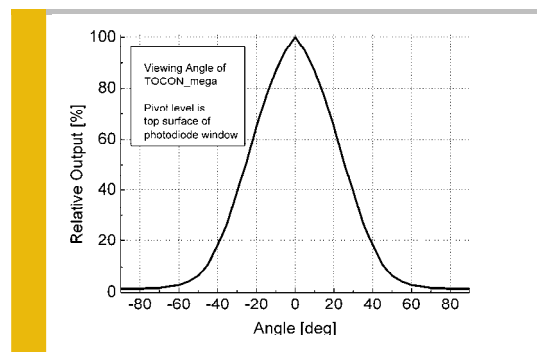
Spectral Response



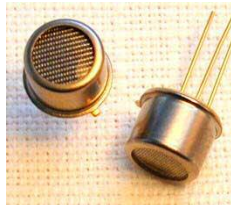
Drawing



Viewing Angle



General Features



Properties of the TOCON_giga

- Broad Band pre-amplified UV detector for highest radiation
- radiation hard steel attenuating mesh for long term stability
- Applications: UV hardening control & other high radiation sources
- 1W/cm² peak radiation results a voltage of approx. 0,4 V

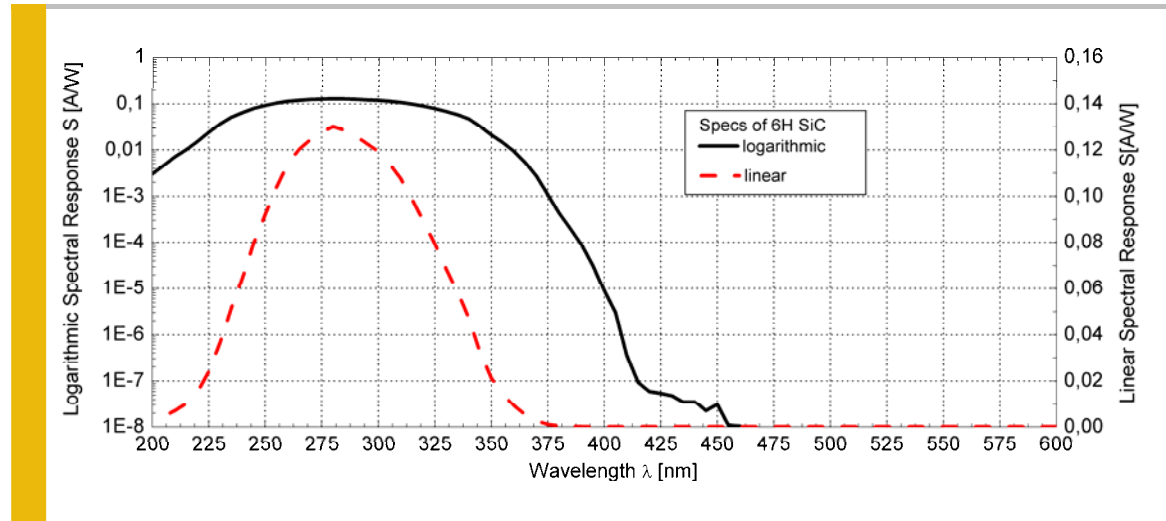
The TOCON pre-amplified UV photodetectors

The TOCON devices are using modern hybride technology to cancel unwanted signal disturbances caused by moisture or electromagnetic radiation. The stable 0...5V output voltage can be directly connected to a SPC controller or a voltage multimeter.

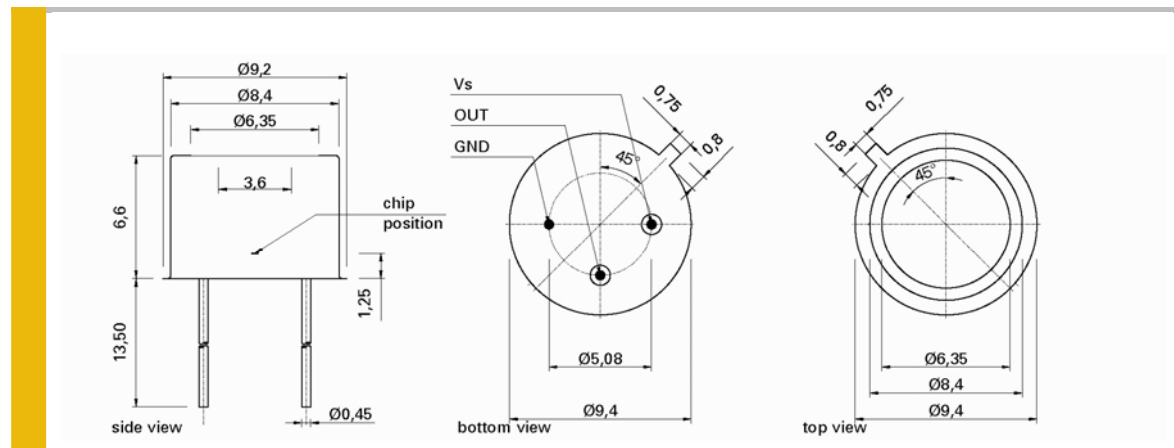
Specifications

Parameter	Symbol	Value	Unit
Maximum Ratings			
Operating Temperature Range	T_{opt}	-25 ... +85	°C
Storage Temperature Range	T_{stor}	-40 ... +100	°C
Soldering Temperature (3s)	T_{sold}	300	°C
General Characteristics (T=25°C)			
Chip area	A_{chip}	0,22	mm ²
Supply voltage	V_{supply}	2,5 ... 5,0	V
max. voltage	V_{max}	5,5	V
saturation voltage	V_{sat}	5,0	V
dark offset voltage	V_{offset}	0,5	mV
Temperature coefficient	Tc	<-0,3	%/K
Current	I	0,8	mA
Bandwidth (-3 dB)	θ	15	Hz
risetime (63%)	t_{rise}	10	ms
Spectral Characteristics (T=25°C)			
Sensitivity at peak	S_{max}	0,4	V/W/cm ²
Wavelength of max. spectral sens.	λ_{max}	280	nm
Sensitivity range ($S=0,1 \cdot S_{max}$)	-	210 ... 380	nm
Visible blindness ($S_{max} / S_{>400nm}$)	VB	10^5	-

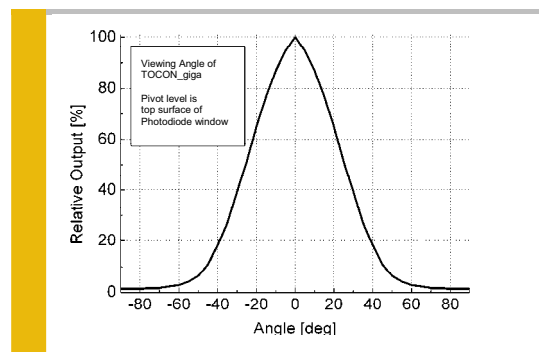
Spectral Response



Drawing



Viewing Angle



General Features



Properties of the TOCON_giga_A

- pre-amplified UVA detector for highest radiation
- radiation hard steel attenuating mesh for long term stability
- Applications: UVA hardening control & other high radiation UVA sources
- 1W/cm² peak radiation results a voltage of approx. 0,3 V

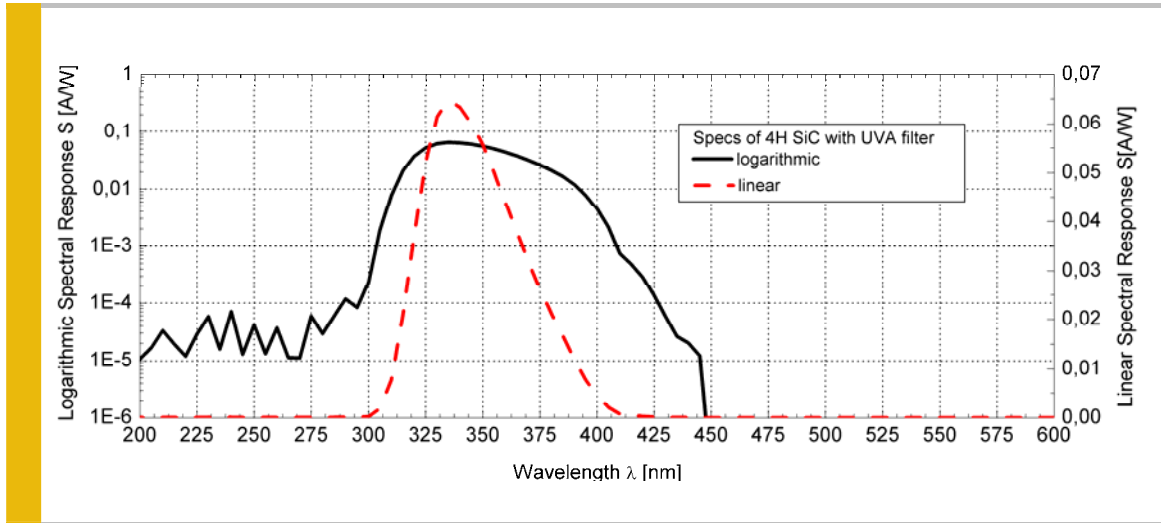
The TOCON pre-amplified UV photodetectors

The TOCON devices are using modern hybride technology to cancel unwanted signal disturbances caused by moisture or electromagnetic radiation. The stable 0...5V output voltage can be directly connected to a SPC controller or a voltage multimeter.

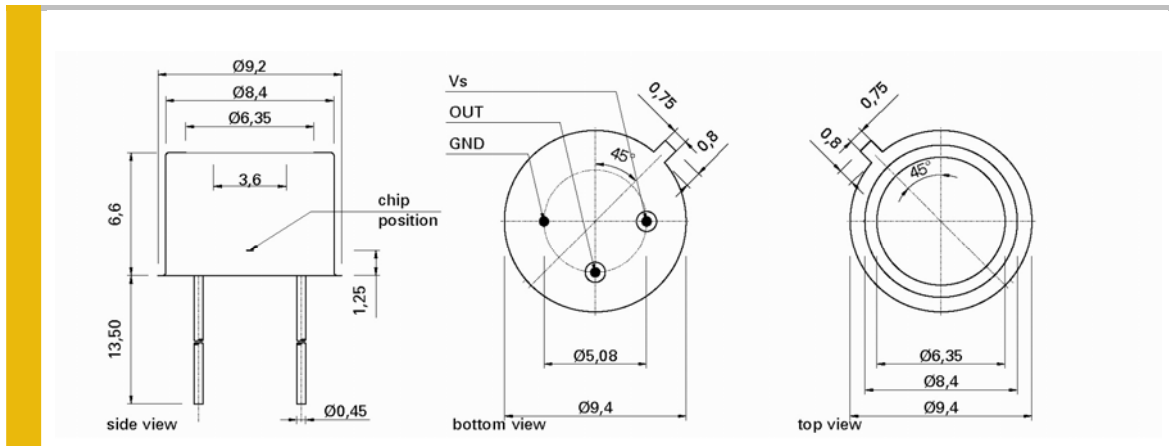
Specifications

Parameter	Symbol	Value	Unit
Maximum Ratings			
Operating Temperature Range	T_{opt}	-25 ... +85	°C
Storage Temperature Range	T_{stor}	-40 ... +100	°C
Soldering Temperature (3s)	T_{sold}	300	°C
General Characteristics (T=25°C)			
Chip area	A_{chip}	0,22	mm ²
Supply voltage	V_{supply}	2,5 ... 5,0	V
max. voltage	V_{max}	5,5	V
saturation voltage	V_{sat}	5,0	V
dark offset voltage	V_{offset}	0,5	mV
Temperature coefficient	T_C	<-0,3	%/K
Current	I	0,8	mA
Bandwidth (-3 dB)	Θ	15	Hz
risetime (63%)	t_{rise}	10	ms
Spectral Characteristics (T=25°C)			
Sensitivity at peak	S_{max}	0,3	V/W/cm ²
Wavelength of max. spectral sens.	λ_{max}	335	nm
Sensitivity range ($S=0,1 \cdot S_{max}$)	-	310 ... 395	nm
Visible blindness ($S_{max} / S_{>400nm}$)	VB	10 ⁵	-

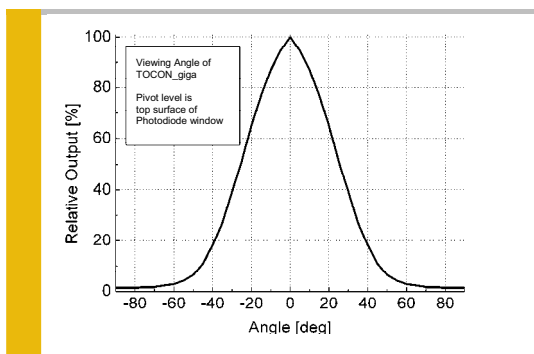
Spectral Response



Drawing



Viewing Angle



General Features



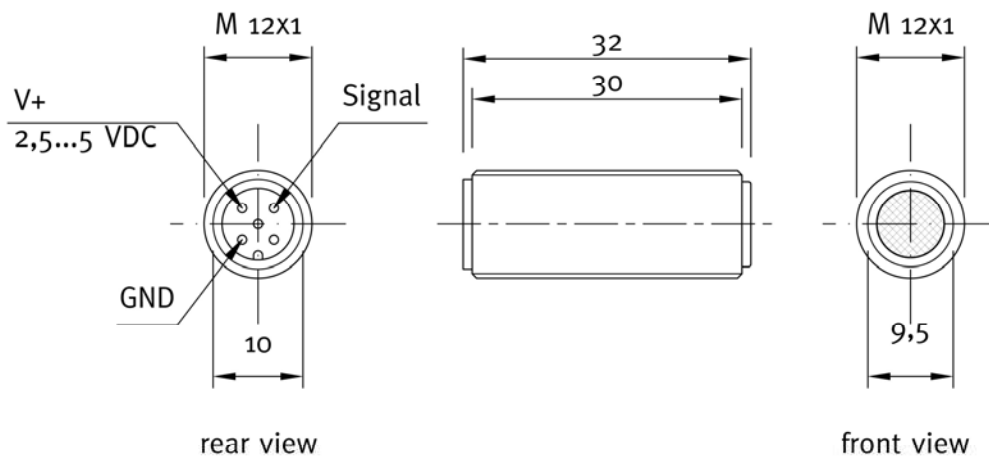
Properties of the TOCON_probe housing

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

Features of the integrated TOCON pre-amplified UV photodetectors

The TOCON devices are using modern hybride technology to cancel unwanted signal disturbances caused by moisture or electromagnetic radiation. The stable 0...5V output voltage can be directly connected to a SPC controller or a voltage multimeter.

Drawing and Connection



cable configuration :
black : +V
brown : ground
blue : signal



Introduction

The applications of UV Sensors are quite varied and therefore the required sensitivity, environmental endurance, spectral response, field of view and electronic output interface must be tailored for individual conditions of use.

This publication presents a variety of different UV Sensors covering a broad range of industrial and scientific UV Sensor applications.

All of the probes are amplified and shielded against electromagnetic interference. The sensors are based on Silicon Carbide (SiC) UV photodiodes, which guarantees highest radiation hardness, long term stability and $>10^5$ visible blindness (ratio of UV to Vis-IR sensitivity).

Please find at page 5 an individual four step configuration procedure which allows the prospective user to select among different probe mechanical designs (STEP 1), to select the correct spectral response (STEP 2), different output types (STEP 3) and to select a sensitivity range (STEP 4). Please feel invited to contact us for assistance.

UV Sensor “UV-Surface”

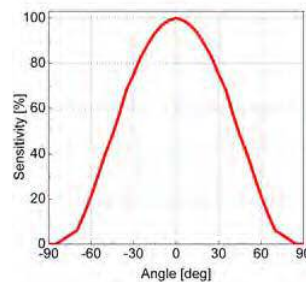
Standard surface-mount 180° FOV UV Sensor

The sensor **UV-Surface** is a cosine corrected sensor to be used for industrial or scientific UV radiation measurements of radiation arriving at a surface, horizontal or vertical or any orientation. On request it is also available in a submersible version. Available calibrated (NIST or PTB traceable) on request.

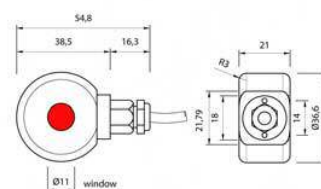
Picture



Field of View



Drawing



UV Sensor “UV-DVGW”

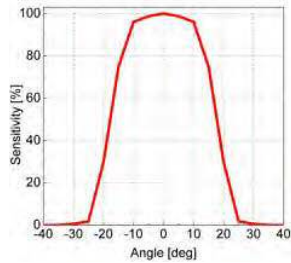
UV Sensor for DVGW certified water purifiers

The sensor **UV-DVGW** is a special type suitable for use with DVGW certified water purifiers. It complies with the standard DVGW W294-3(2006). Always delivered calibrated according to DVGW requirements.

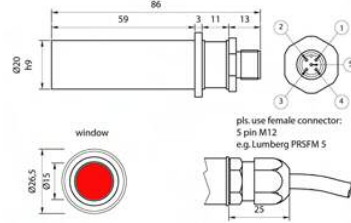
Picture



Field of View



Drawing



UV Sensor “UV-MINILOG”

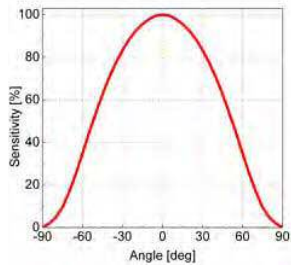
UV Datalogger with PC software

The sensor UV-MINILOG is a battery powered UV datalogger with a large internal data storage (2 million readings). It can log data for up to 18 months without recharging. It is IP67 water proof and comes with free PC software. The UV-Minilog can be equipped with all UV sensors to be selected at STEP 2 and STEP 4 of the page 5 configuration guide.

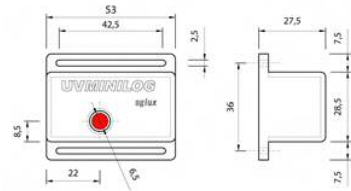
Picture



Field of View



Drawing



UV Sensor “TOCON”

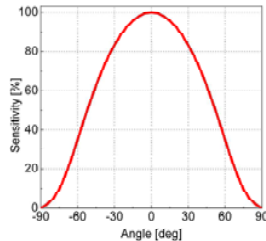
Pre-amplified UV Photodiode

The sensor TOCON is a pre-amplified UV Photodiode consisting of SiC chip and hybrid preamp inside a hermetic TO-39 package. The TOCON can be equipped with all specifications to be selected at STEP 2 and STEP 4 of the page 5 configuration guide.

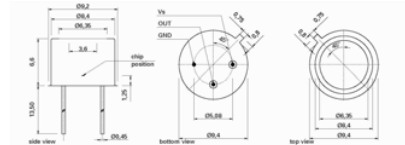
Picture



Field of View



Drawing



Specifications, valid for all UV Sensors

Fixed Specifications

Parameter	Value
Dimensions	pls. refer to the drawing
Temp. Coefficient	0,035%/K
Operating Temp.	20...+80°C
Storage Temp.	40...+80°C
Humidity	<80%, non condensing for Air versions; 100% immersed for submerible

Configurable Specifications

Parameter	Value
Absolute Sensitivity	1nW/cm ² ... 10W/cm ²
Spectral Sensitivity	UV Broadband, UVA, UVB, UVC, UV Index
Signal Output	0...5V, 4...20mA, USB, impulse count
Connections	2m cable or 2m cable with 5 pin male connector type Lumberg PRSFM5

Please find the configuration guide at page 5 of this catalog.

Monitor Accessories



Please consider our UV monitor and UV controller offer → www.sglux.com/monitor

Calibration



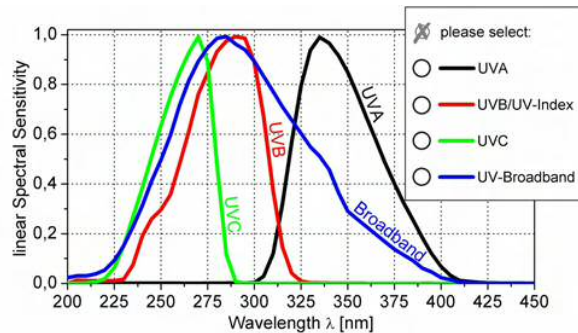
We are pleased to issue an individual quotation for NIST or PTB traceable calibration.

STEP 1 → Selection of probe mechanical design

Please tick your selection. Please find detailed description of the mechanical design above

<input checked="" type="checkbox"/> Type	Description
<input type="radio"/> UV Surface	Standard surface mount 180° FOV UV Sensor
<input type="radio"/> UV Air	Standard axis oriented in chamber UV Sensor
<input type="radio"/> UV Cosine	Waterproof UV Sensor for outdoor use
<input type="radio"/> UV Water	10 bar water pressure proof
<input type="radio"/> UV DVGW	UV Sensor for DVGW certified water purifiers
<input type="radio"/> UV MINILOG	UV Datalogger with PC software
<input type="radio"/> TOCON	Pre amplified UV Photodiode

STEP 2 → Configuration of the Spectral Sensitivity



Please select one spectral sensitivity curve (shown left). Other spectral responses are available on request.

In the UV, we use SiC photodetectors which makes the probe radiation hard and stable. The visible blindness is better than 10^5 .

STEP 3 → Signal Output

Please tick your selection. The pin configuration is shown in the drawings on previous pages.

<input checked="" type="checkbox"/> Output Type	Description	<input checked="" type="checkbox"/> Connection = "cable"	<input checked="" type="checkbox"/> Connection = "male plug"
<input type="radio"/> 0...5V	0...5V voltage output proportional to radiation input, supply voltage is 7..24VDC, current consumption is <30mA	<input type="radio"/> V ₀ =brown, V ₊ =white, Out=green, Shield=black	<input type="radio"/> V ₀ =1, V ₊ =2, Out=3
<input type="radio"/> 4...20mA	4...20mA current loop for PLC controllers. The current is proportional to the radiation, supply voltage is 24VDC	<input type="radio"/> V ₀ =brown, V ₊ =white	<input type="radio"/> V ₀ =1, V ₊ =2
<input type="radio"/> USB	The signal is transmitted via USB to a computer. Software is included.	→	<input type="radio"/> Standard USB A plug, 1,5 m cable
<input type="radio"/> Pulse	UV pulse counting for pulses > 30ns, signal out is 5V when the pulse intensity is above threshold and 0V when below.	<input type="radio"/> V ₀ =brown, V ₊ =white, Out=green, Shield=black	<input type="radio"/> V ₀ =1, V ₊ =2, Out=3

STEP 4 → Sensitivity

We configure your UV sensor for intensities across 10 orders of magnitude from 1nW/cm² to 10W/cm². For good dynamic behaviour the min and max. intensity at the probe position needs to be known as precisely as possible. Please fill that value, if known, into the box below. If only a rough estimate is possible, please estimate it in the range selection fields. We will contact you for further refinement of the range.

max. radiation in mW/cm² or, if not precisely known, range estimation

1nW/cm² ... 10μW/cm² 10μW/cm² ... 100mW/cm² 100mW/cm² ... 10W/cm²

Abstract

For monitoring high UV irradiance, silicon carbide (SiC) based photodiodes are used. In this paper we describe the characterization of novel SiC UV photodiodes in terms of their spectral and integral responsivity. Special attention is paid to the aging behavior of the photodiodes due to high UV irradiance. Artificial aging of the samples is performed by illumination with a high power medium pressure mercury discharge lamp.

Preliminary studies

- comparison of different photodiodes: SiC from Cree and sglux
AlGaN from Genicom
- long term irradiation with a low pressure UVC lamp (Philips PL-L 36W 4P, approx. 4.2mW/cm² at peak wavelength)

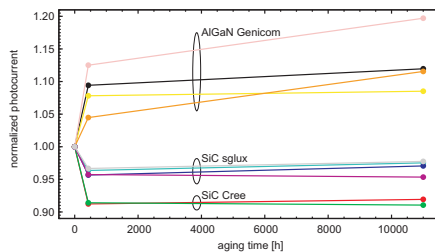


Figure 1: Normalized photocurrent for different types of UV photodiodes during long term irradiation with a low pressure UVC lamp.

- SiC photodiodes loose responsivity in the beginning of the irradiation (Cree: 9%, sglux: 4%), then no further degradation
- AlGaN photodiodes show an increased responsivity (up to 20%) and a broad scatter

SiC photodiodes used in this study

- 8 novel SiC photodiodes
- manufacturer sglux SolGel Technologies GmbH
- improved visible blindness compared to SiC photodiodes from Cree
- area of the SiC chip: 1mm²

Measurement setups

1. Artificial aging of the photodiodes

- irradiation with a high power medium pressure Hg discharge lamp
uv-technik meyer UVH2022-17, spectrum see fig. 2
- operated at about 1.8kW constant electric power
- irradiance level in the beginning approx. 17mW/cm²
- SiC reference detector for irradiance monitoring
- diodes 01, 03 - 06, 08 are irradiated
- diodes 02 and 07 are not exposed to UV radiation, and used as reference

2. Characterization of the photodiodes

- irradiation with a low pressure Hg discharge lamp
Wedeco NLR 1825, spectrum see fig. 2
- UV irradiance approx. 1.04mW/cm²
- SiC reference detector for irradiance monitoring
- diodes 01 - 08 are characterized

3. Spectral responsivity of the photodiodes

- obtained at PTB's differential spectral responsivity (DSR) facility
- usually used for calibration of solar cells, modified for measurements in the UV range
- diodes 01 - 04 are investigated

Spectral emission from the UV lamps

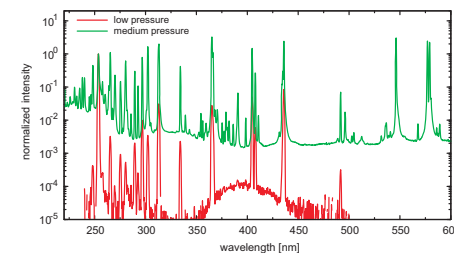


Figure 2: Spectral emission from the low (red line) and medium (green line) pressure lamps. Normalized to 253.75nm.

Photodiode behavior during artificial aging

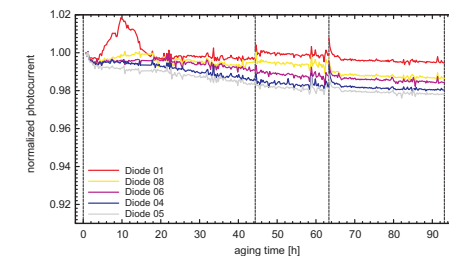


Figure 3: Normalized photocurrent for 5 photodiodes during aging with the medium pressure lamp.

- total aging time approx. 93h
- aging interrupted for characterization with the low pressure Hg lamp (dashed lines)
- decrease in responsivity up to 2.2%

Photodiode characterization

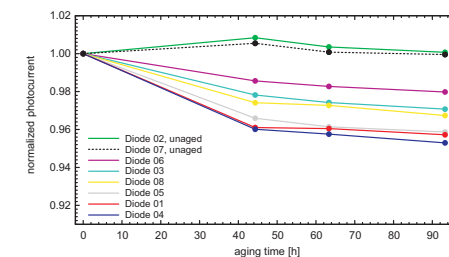


Figure 4: Normalized photocurrent, characterization with the low pressure lamp.

Unaged photodiodes 02 and 07:

- no decrease in photocurrent

Aged photodiodes 01, 03 - 06, and 08:

- decrease in responsivity up to 4.7%
- much larger decrease in responsivity as compared to fig. 3
- aging of the photodiodes mainly in the beginning

Spectral responsivity

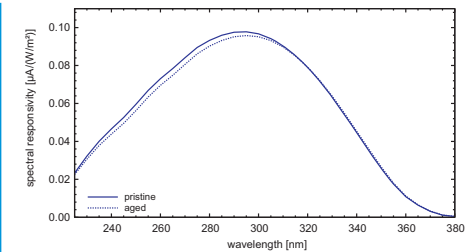


Figure 5: Spectral responsivity of diode 04 in pristine state (solid line) and after 93h of aging (dashed line).

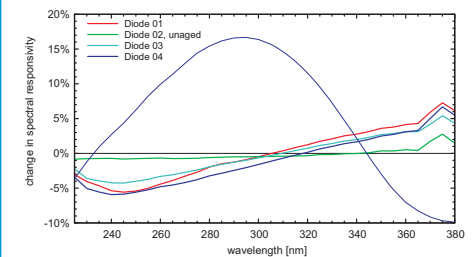


Figure 6: Change in spectral responsivity after aging of diodes 01 - 04. Additionally, the spectral responsivity of diode 04 in pristine state is shown as thin line.

Unaged photodiode 02:

- no change in spectral responsivity

Aged photodiodes 01, 03, and 04:

- change in spectral responsivity is observed
- change is wavelength dependent
- below approx. 310nm: loss in responsivity
- above approx. 310nm: gain in responsivity

Change in integral responsivity

Due to wavelength dependent responsivity:

- integral responsivity depends on the lamp used
- calculation uses spectral responsivity (fig. 6) and spectra of the low and medium pressure lamps (fig. 2)

	low pressure	medium pressure
Diode 01	-4.7%	-1.4%
Diode 02	-0.7%	-0.5%
Diode 03	-3.5%	-1.2%
Diode 04	-5.0%	-2.3%

Calculated values perfectly agree with measurement data from both types of lamps (fig. 3 and fig. 4).

Conclusions

Very recent measurements after additional 120h of irradiation: photodiodes are not aging significantly any further
⇒ after burn-in: SiC photodiodes are very stable

Outlook

- degradation studies of the photodiodes will be continued
- additional photodiodes will be investigated