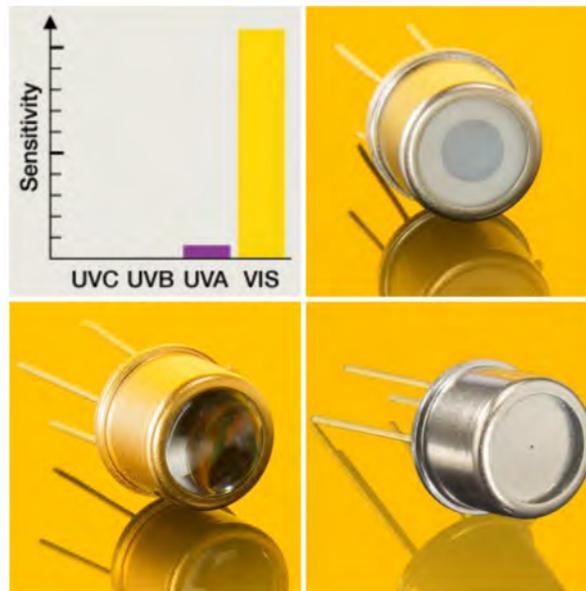


Silicon Hybrid Photodetectors (Visible TOCON) Datasheets



- **Visible photodiode with integrated preamplifier**
- **Si based sensors with 0 to 5 V voltage output**
- **spectral sensitivity from 390 to 800 nm, peak wavelength 560 nm**



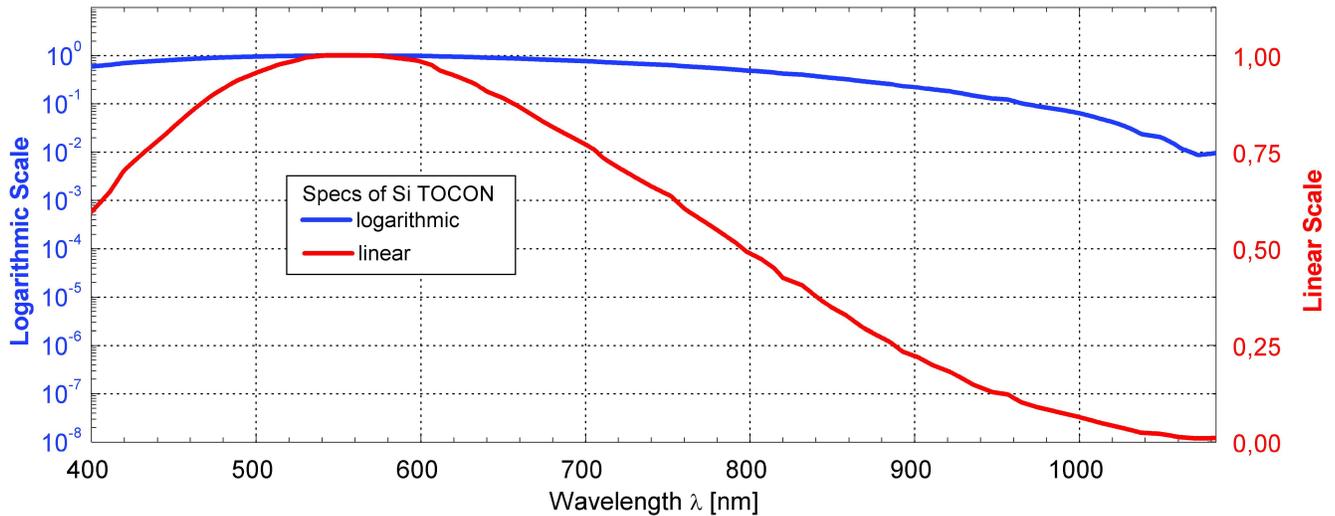
 **Boston**Electronics

91 Boylston Street, Brookline, MA 02445
tel: (617)566-3821 shop.boselec.com
www.boselec.com boselec@boselec.com

Advantages of the Silicon TOCONs – Hybrid Photodetectors

- Wide range of selectable sensitivities – picowatts/cm² to Watts/cm²
- Selectable models covering 12 orders of magnitude of sensitivity
- 0-5 volts amplified output
- voltage output interfaces easily with your next stage electronics
- Compact TO packaging
- Well shielded from external noise
- Wide spectral coverage:
 - UV – Visible - Near IR response
 - 390 to 800 nm
- Applications include:
 - Analytical instrumentation
 - Chemical analysis
 - Biomedical
 - Illumination Control
 - Laser detection
 - light source detection





| TOCON_ | ABC, A, B, C, blue, GaP or Si | 1 ... 10 |
|--------|--|--|
| | Spectral response | Irradiance limits ($V_{supply}=5V, \lambda = \lambda_{max}$) |
| | ABC = broadband $\lambda_{max} = 290 \text{ nm}$ $\lambda_{510\%} = 227 \text{ nm} \dots 360 \text{ nm}$ | 1 = 1.8 pW/cm ² ... 18 nW/cm ² |
| | A = UVA $\lambda_{max} = 331 \text{ nm}$ $\lambda_{510\%} = 309 \text{ nm} \dots 367 \text{ nm}$ | 2 = 18 pW/cm ² ... 180 nW/cm ² |
| | B = UVB $\lambda_{max} = 280 \text{ nm}$ $\lambda_{510\%} = 243 \text{ nm} \dots 303 \text{ nm}$ | 3 = 180 pW/cm ² ... 1.8 μW/cm ² |
| | C = UVC $\lambda_{max} = 275 \text{ nm}$ $\lambda_{510\%} = 225 \text{ nm} \dots 287 \text{ nm}$ | 4 = 1.8 nW/cm ² ... 18 μW/cm ² |
| | Blue = blue light $\lambda_{max} = 445 \text{ nm}$ $\lambda_{510\%} = 390 \text{ nm} \dots 515 \text{ nm}$ | 5 = 18 nW/cm ² ... 180 μW/cm ² |
| | GaP = UV + VIS $\lambda_{max} = 445 \text{ nm}$ $\lambda_{510\%} = 190 \text{ nm} \dots 570 \text{ nm}$ | 6 = 180 nW/cm ² ... 1.8 mW/cm ² |
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| | | 9 = 180 μW/cm ² ... 1.8 W/cm ² |
| | | 10 = 80 mlux ... 80 Mlux |
| | | 2 = up to UVI 30 |

Silicon TOCONs >>>

TOCON_Si1

v-lambda weighted Si based VIS photodetector with integrated amplifier
for lux measurement



Properties of the TOCON_Si1

- v-lambda weighted Si based VIS photodetector in TO5 housing with diffusor
- 0... 5 V voltage output
- peak wavelength at 560 nm
- max. illuminance at peak is 80 mlux,
minimum illuminance (resolution limit) is 80 μ lux
- Applications: low illuminance measurement

What is a TOCON?

A TOCON is a photodetector with integrated amplifier converting visible light into a voltage. The V_{out} pin of the TOCON can be directly connected to a controller, a voltmeter or any other data analyzing device with voltage input. Modern electronic components and a hermetically sealed metal housing with glass window eliminate noise caused by parasitic paths inside the package and EMI. A TOCON is a perfect solution for each ambient light sensing application starting from stray light detection at mlux level up to sun light measurements at Mlux level. This ten orders of magnitude measurement range is covered by ten different TOCONs that differ by their sensitivity.

NOMENCLATURE

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TOCON_Si1

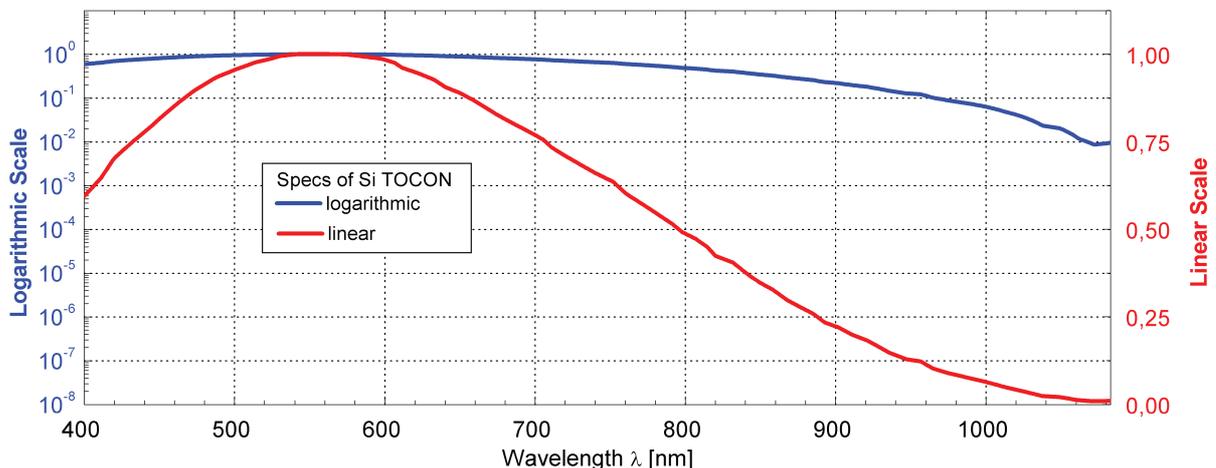
v-lambda weighted Si based VIS photodetector with integrated amplifier
for lux measurement



SPECIFICATIONS

| Parameter | Symbol | Value | Unit |
|--|---------------------|---------------------|---------|
| Spectral Characteristics | | | |
| Typical Responsivity at Peak Wavelength | S_{max} | 62 | mV/mlux |
| Wavelength of max. Spectral Responsivity | λ_{max} | 560 | nm |
| Responsivity Range ($S=0.1*S_{max}$) | – | 390 ... 800 | |
| General Characteristics (T=25°C, V_{supply}=+5 V) | | | |
| Supply Voltage range | V _S | 2.5 ... 5 | V |
| Saturation Voltage | V _{Sat} | V _S - 5% | V |
| Typical dark output voltage at 10 MOhm load | V _{Offset} | 700 | µV |
| Temperature Coefficient at Peak | T _c | < +0,16 | %/K |
| Typical Current Consumption | I | 150 | µA |
| Bandwidth (-3 dB) | B | 15 | Hz |
| Risetime (10-90%) | t _{rise} | 0.073 | s |
| Maximum Ratings | | | |
| Operating Temperature | T _{opt} | -25 ... +85 | °C |
| Storage Temperature | T _{stor} | -40 ... +100 | °C |
| Maximum soldering temperature (for 3 seconds) | T _{sold} | 300 | °C |

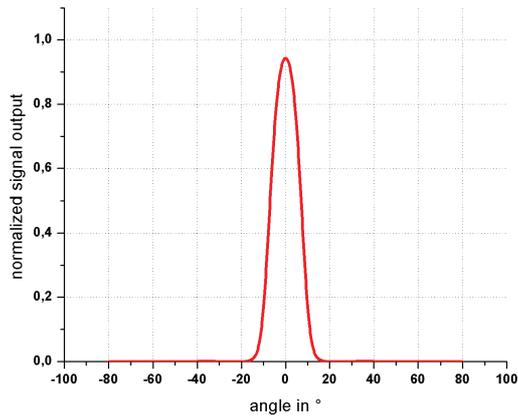
NORMALIZED SPECTRAL RESPONSIVITY



TOCON_Si1

v-lambda weighted Si based VIS photodetector with integrated amplifier
for lux measurement

FIELD OF VIEW

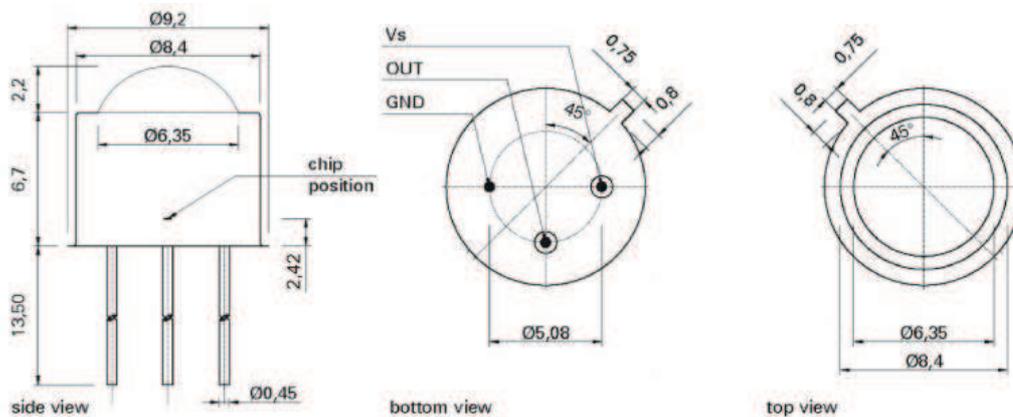


Measurement Setup:

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 detector window

DRAWING



TOCON_Si1

v-lambda weighted Si based VIS photodetector with integrated amplifier
for lux measurement

APPLICATION NOTE FOR TOCONS

The TOCONS need a supply voltage of $V_{\text{supply}} = 2.5 \dots 5V_{\text{DC}}$ and can be directly connected to a controller or voltmeter. Please note that the theoretic maximum signal output is always a little less (approx. 5%) than the supply voltage. To learn more about perfect use of the TOCONS please refer to the TOCON FAQ list published at www.sglux.com.

CAUTION! Wrong wiring leads to destruction of the device.

For easy setup of the device please ask for a TOCON starter kit.



Miniature steel housing with M12x1 thread for the TOCON series

- Optional feature for all TOCON detectors
- Robust stainless steel M12x1 thread body, length 32 mm
- Integrated sensor connector (Binder 4-Pin plug) with 2m connector cable
- Easy to mount and to connect



Miniature PTFE housing with M12x1 thread for the TOCON series

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- Integrated sensor connector (Binder 4-Pin plug) with 2m connector cable
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The PTFE housing reduces the signal output by approx. 95%. Please consider this while selecting the TOCON's sensitivity range.



Plastic probes

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- probes in small plastic housings with a TOCON inside
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- Cable available



Water pressure proof TOCON housing

- Optional feature for all TOCON detectors without concentrator lens
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- Easy to mount and to connect
- Integrated sensor connector (Binder 5-Pin plug)
- Cable available

TOCON_Si7

v-lambda weighted Si based VIS photodetector with integrated amplifier for lux measurement



Properties of the TOCON_Si7

- v-lambda weighted Si based VIS photodetector in TO5 housing with diffuser
- 0... 5 V voltage output
- peak wavelength at 560 nm
- max. illuminance at peak is 80 klux, minimum illuminance (resolution limit) is 80 lux
- Applications: daylight illuminance measurement

What is a TOCON?

A TOCON is a photodetector with integrated amplifier converting visible light into a voltage. The V_{out} pin of the TOCON can be directly connected to a controller, a voltmeter or any other data analyzing device with voltage input. Modern electronic components and a hermetically sealed metal housing with glass window eliminate noise caused by parasitic paths inside the package and EMI. A TOCON is a perfect solution for each ambient light sensing application starting from stray light detection at mlux level up to sun light measurements at Mlux level. This ten orders of magnitude measurement range is covered by ten different TOCONs that differ by their sensitivity.

NOMENCLATURE

| TOCON_ | ABC, A, B, C, blue, GaP or Si | 1 ... 10 |
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| | | 10 = 80 mlux ... 80 Mlux |
| | | 2 = up to UVI 30 |

TOCON_Si7

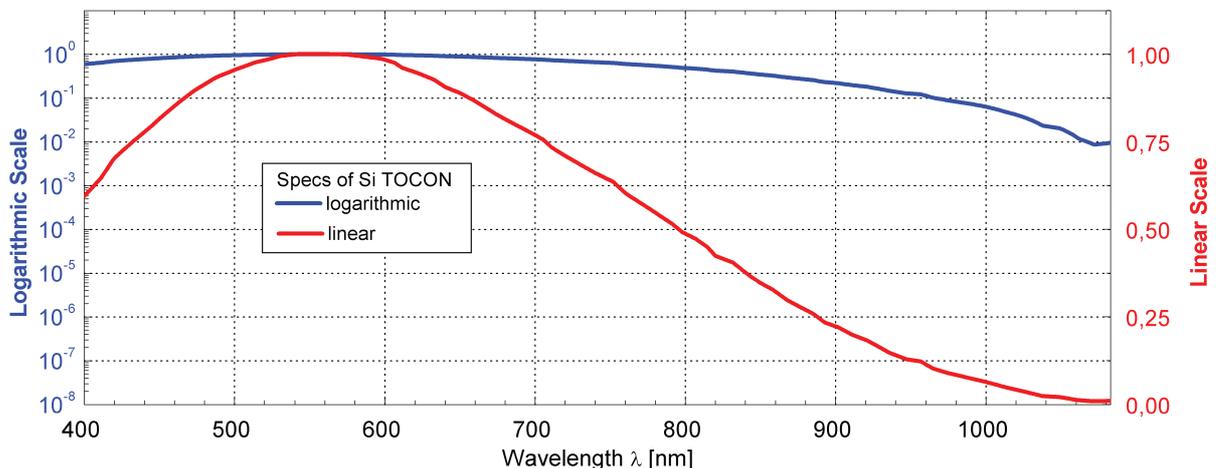
v-lambda weighted Si based VIS photodetector with integrated amplifier
for lux measurement



SPECIFICATIONS

| Parameter | Symbol | Value | Unit |
|--|-----------------|--------------|---------|
| Spectral Characteristics | | | |
| Typical Responsivity at Peak Wavelength | S_{max} | 62 | mV/klux |
| Wavelength of max. Spectral Responsivity | λ_{max} | 560 | nm |
| Responsivity Range ($S=0.1*S_{max}$) | – | 390 ... 800 | |
| General Characteristics (T=25°C, V_{supply}=+5 V) | | | |
| Supply Voltage range | V_S | 2.5 ... 5 | V |
| Saturation Voltage | V_{Sat} | $V_S - 5\%$ | V |
| Typical dark output voltage at 10 MOhm load | V_{Offset} | 700 | μV |
| Temperature Coefficient at Peak | T_c | < +0,16 | %/K |
| Typical Current Consumption | I | 150 | μA |
| Bandwidth (-3 dB) | B | 15 | Hz |
| Risetime (10-90%) | t_{rise} | 0.073 | s |
| Maximum Ratings | | | |
| Operating Temperature | T_{opt} | -25 ... +85 | °C |
| Storage Temperature | T_{stor} | -40 ... +100 | °C |
| Maximum soldering temperature (for 3 seconds) | T_{sold} | 300 | °C |

NORMALIZED SPECTRAL RESPONSIVITY

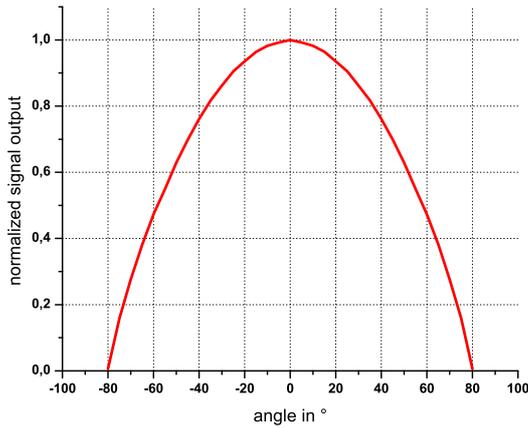


TOCON_Si7

v-lambda weighted Si based VIS photodetector with integrated amplifier
for lux measurement



FIELD OF VIEW

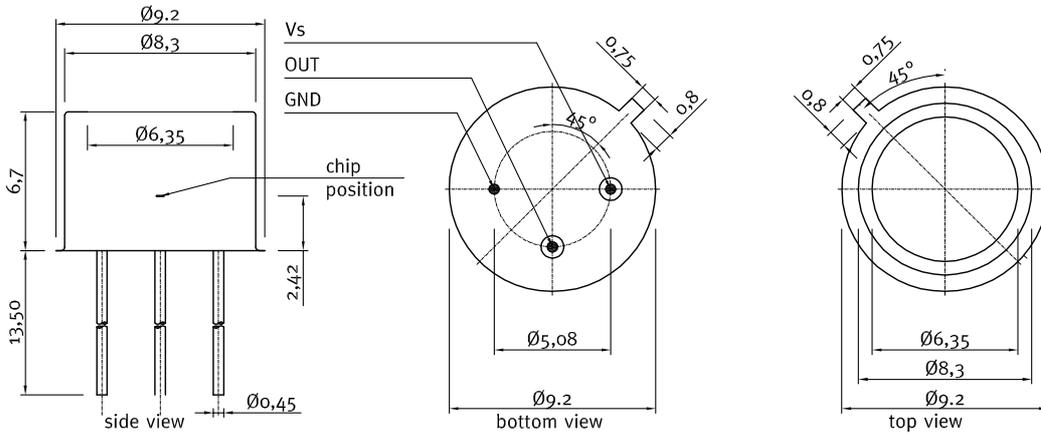


Measurement Setup:

- 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 detector window

DRAWING



TOCON_Si7

v-lambda weighted Si based VIS photodetector with integrated amplifier
for lux measurement

APPLICATION NOTE FOR TOCONS

The TOCONS need a supply voltage of $V_{\text{supply}} = 2.5 \dots 5V_{\text{DC}}$ and can be directly connected to a controller or voltmeter. Please note that the theoretic maximum signal output is always a little less (approx. 5%) than the supply voltage. To learn more about perfect use of the TOCONS please refer to the TOCON FAQ list published at www.sglux.com.

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- Integrated sensor connector (Binder 4-Pin plug) with 2m connector cable
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The PTFE housing reduces the signal output by approx. 95%. Please consider this while selecting the TOCON's sensitivity range.



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- probes in small plastic housings with a TOCON inside
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Water pressure proof TOCON housing

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TOCON_Si10

v-lambda weighted Si based VIS photodetector with integrated amplifier
for lux measurement



Properties of the TOCON_Si10

- v-lambda weighted Si based VIS photodetector in TO5 housing with diffusor
- 0... 5 V voltage output
- peak wavelength at 560 nm
- max. illuminance at peak is 80 Mlux,
minimum illuminance (resolution limit) is 80 klux
- Applications: strong illuminance measurement

What is a TOCON?

A TOCON is a photodetector with integrated amplifier converting visible light into a voltage. The V_{out} pin of the TOCON can be directly connected to a controller, a voltmeter or any other data analyzing device with voltage input. Modern electronic components and a hermetically sealed metal housing with glass window eliminate noise caused by parasitic paths inside the package and EMI. A TOCON is a perfect solution for each ambient light sensing application starting from stray light detection at mlux level up to sun light measurements at Mlux level. This ten orders of magnitude measurement range is covered by ten different TOCONs that differ by their sensitivity.

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TOCON_Si10

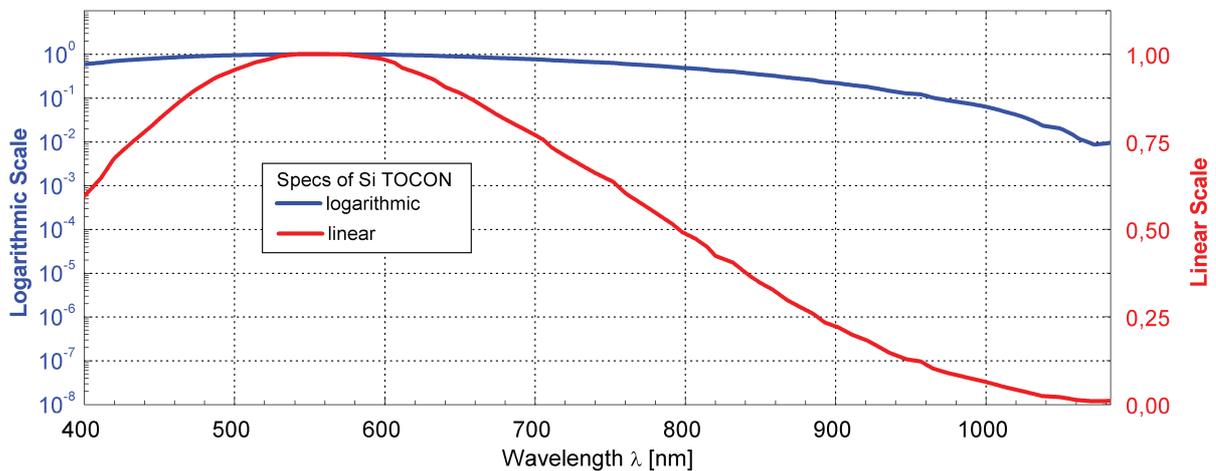
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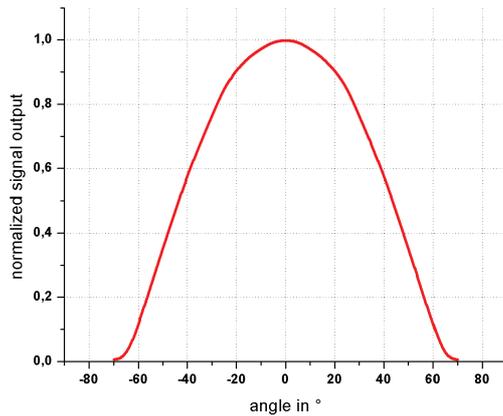
NORMALIZED SPECTRAL RESPONSIVITY



TOCON_Si10

v-lambda weighted Si based VIS photodetector with integrated amplifier
for lux measurement

FIELD OF VIEW

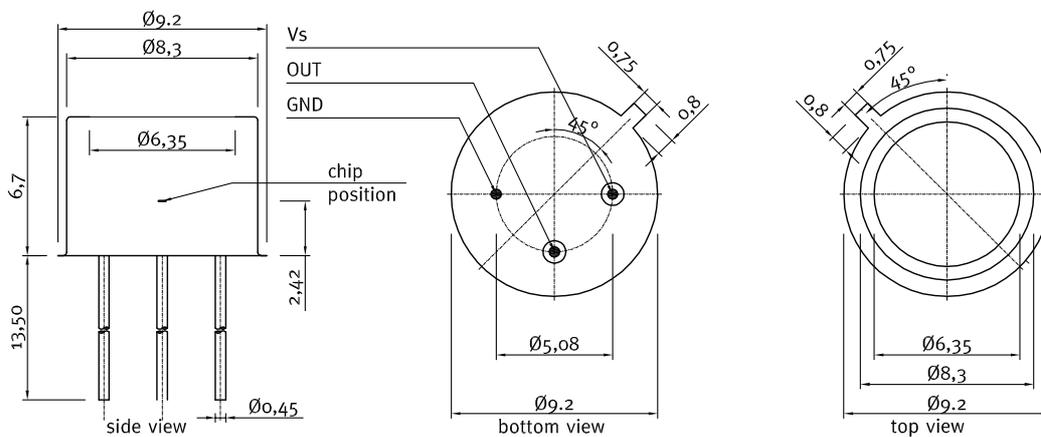


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DRAWING



TOCON_Si10

v-lambda weighted Si based VIS photodetector with integrated amplifier
for lux measurement



▶ APPLICATION NOTE FOR TOCONS

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- Cable available

TOCON starter kit

optional TOCON accessory



▶ PROPERTIES OF THE TOCON STARTER KIT

- kit for initial testing setup - take a standard voltmeter from your toolbox and get into the world of UV radiometry
- output voltage 0 ... 5 V
- usable with all TOCON detectors (not included)
- 9 V block battery included, typical runtime 3000 hours
- separate 4 mm banana plug ground and signal cable for easy connection

▶ HOW TO CONNECT

- put a TOCON into the 3 pin transistor socket
- connect the 9 V battery
- put the 4 mm banana plug connectors into your voltmeter

yellow = signal voltage out = plus terminal of the voltmeter

black = ground = ground terminal of the voltmeter

Advantages of the Silicon TOCONs – Hybrid Photodetectors

- Wide range of selectable sensitivities – picowatts/cm² to Watts/cm²
- Nine selectable models covering 12 orders of magnitude of sensitivity
- 0-5 volts amplified output
- voltage output interfaces easily with your next stage electronics
- Compact TO packaging
- Well shielded from external noise
- Wide spectral coverage:
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 - 290 to 1010 nm
- Applications include:
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