ION IMPLANTED SIC UV-PHOTODIODES
Tuneable for UV-A/B sunlight and visible blind UV-C detection

**General description**
- A p+n-junction formed by ion implantation in epitaxially grown n-layer on highly n-doped 4H-SiC-substrate
- Strong photon absorption in the desired UV range
- No absorption of visible light, e.g. from artificial sources

**Advantages**
- Visible-blind design (excellent rejection of artificial light sources)
- Higher sensitivity without cooling compared to silicon
- Less intrinsic noise compared to silicon sensor devices
- EQE up to 60% (next generation EQE > 75% expected)
- Ion implantation technology offers possibility of very shallow emitters
- Reduced process effort and higher homogeneity compared to fabrication using epitaxy

**Features**
- Wide bandgap of 4H-SiC (3.26 eV) offers possibility of visible blind UV-detection without additional optical filters
- Selectivity to sunlight can be adjusted by the sensor design
- Low intrinsic carrier concentration - very low dark current

**Benefits**
- Higher turnover from new applications and increased sensitivity
- Cost reduction from room temperature operation (no sensor cooling required)
Spectral responsivity
- Tunable maximum, e.g. at 260 nm: 110 mA/W
- Near-constant responsivity from 270-300 nm achievable
- Typical peak external quantum efficiency of 55%

Reverse IV-characteristics (typ.)
- Dark current < 1 nA/cm²
- Typ. SNR > 57 dB
- Cap. typ. 20 nF/cm² at 0 V

Temperature characteristics
- Operation up to 200 °C (limited by packaging, usability of SiC chip at higher temperatures)
- Even higher photocurrent at higher temp. (up to 200 °C), especially for longer wavelengths
- No measurable increase of dark current (Fig. 2)

Application examples
- UV water purification (typ. 254 nm) - Fig. 1
- Flame and heat detection (several peaks) - Fig. 3
- Sunlight UV (280 – 380 nm) monitoring - Fig. 4 & 5

Device dimensions
- Die size x (typ.): 1.5 mm*
- Emitter-size y: 1.3 mm*
- Optical area (typ.): 1.6 mm²*
- Bond pad area b (typ.): 0.25 x 0.25 mm*
  *others on request