REVISIONS		
REV.	DESCRIPTION	APPROVED
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DATA-SHEET

MCS3AT/BT

3-element color sensor – TO5

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1. FUNCTION

The color sensors are made of 3 Si-PIN photo diodes integrated on chip. They are carried out as segments of a ring with the diameter of 2,0 mm. The design as Si-PIN photo diodes allows signal frequencies up to MHz-range. In order to achieve a small cross talk between the photodiodes the individual sectors were separated from each other by additional structures. Each of these photodiodes is sensitized with dielectric spectral filter for its color range, preferably for the primary colors red, green and blue.

2. APPLICATION

- Quality control
- Monitoring the production
- Control of manufacturing
- Detection of color marks

3. FEATURES

Dielectric filters guaranties the good optical properties of the color sensors, such as:

- high transmission
- slight aging of the filter
- high temperature stability
- high signal frequency
- reduced cross talk
- small size (diameter of the optical sensitive surface ca. 2 mm)
- ROHS conform

4. CONSTRUCTION

- 3 on chip integrated PIN photo diodes
- different package versions
- dielectric filters for the three color ranges: red, green and blue (TO5, with/without IR-blocked)
- Electrical connections
  - three anodes
  - one common cathode

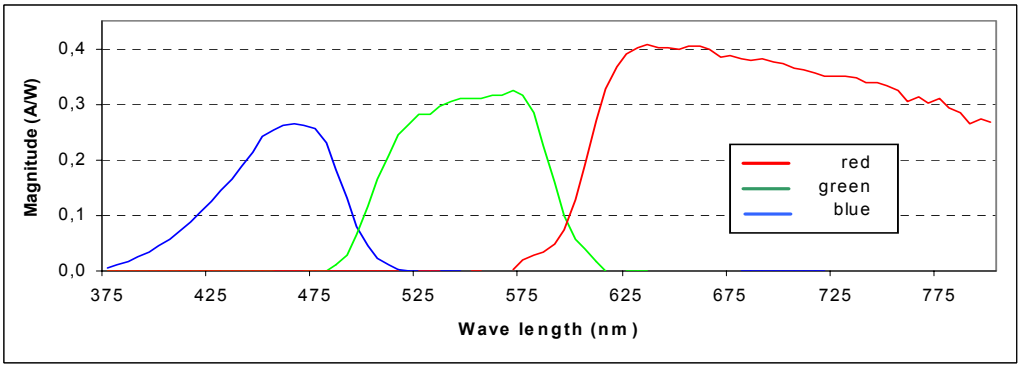
5. MAXIMUM RATINGS / CHARACTERISTICS

(T_A = 25°C; per single diode)

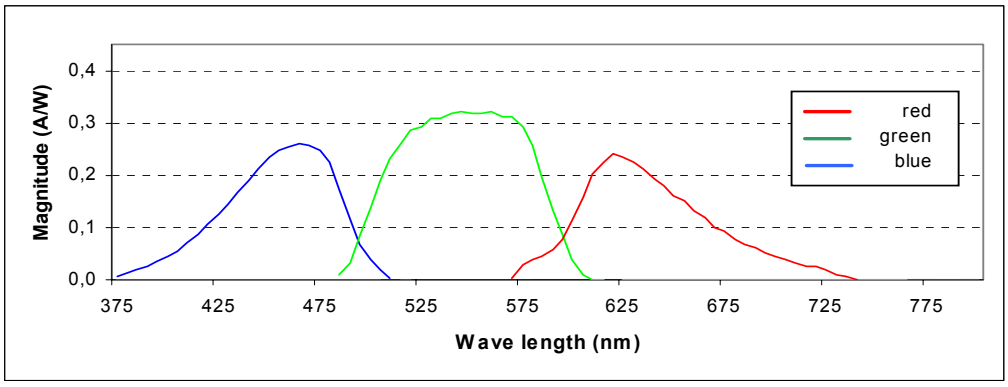
Description	Symbol	Condition	typ. Value	Unit
Diameter of the light sensitivity area	D		2,0	mm
Light sensitivity area per element	A		0,85	mm^2
Photo sensitivity of color ranges	S_{max}	λ_B = 470 nm λ_G = 570 nm λ_R = 650 nm	0,26 0,33 (0,25) 0,41	A/W
Field of the spectral sensitivity ± 2%*λ	λ_B λ_G λ_R		400 - 510 490 - 610 590 - 750	nm
Rise and fall time of the photocurrent	t_r, t_f		<1	µs
Noise equivalent power	NEP	f_R = 100 Hz	$<10^{-13}$	W/√Hz
Crosstalk			1	%
Angle of incidence	φ	$\Delta\lambda_{(Filter)} < 1\%*\lambda$	8	Grad
Operating temperature range	T_{op}		0 ... +70	°C
Storage temperature range	T_{st}		-20 ... +80	°C
Soldering temperature	T	2…3 sec	240	°C
Reference voltage (see also chapter 9 Application Circuit)	VREF		0,4 … VDD–0,4	V

6. CHARACTERISTIC CURVE

6.1 Typical spectral sensitivity of the 3-element color sensor (MCS3AT)[1]



6.2 Typical spectral sensitivity of the 3-element sensor with IR-blocking (MCS3BT)[1]



[1] Typical characteristic sensitivity; scanned by monochromatic light with FWHM 27nm, not suitable for narrow light, e.g. laser

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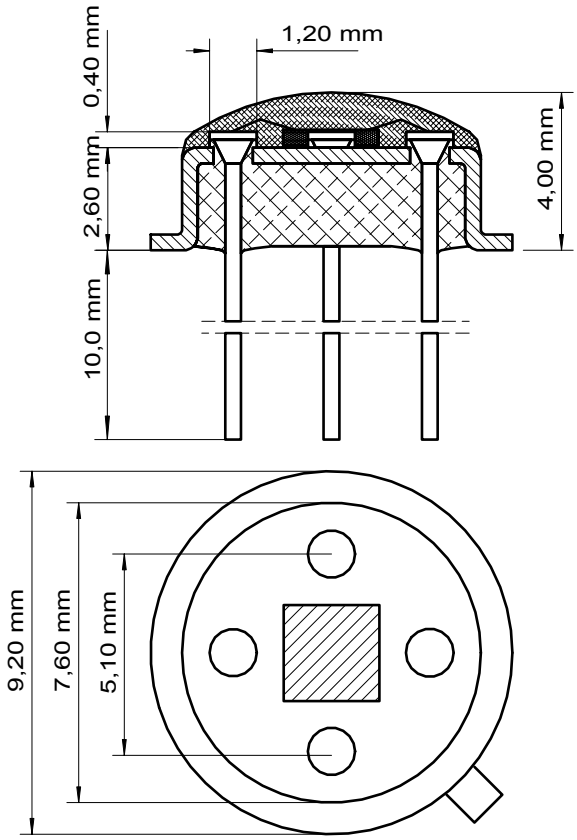
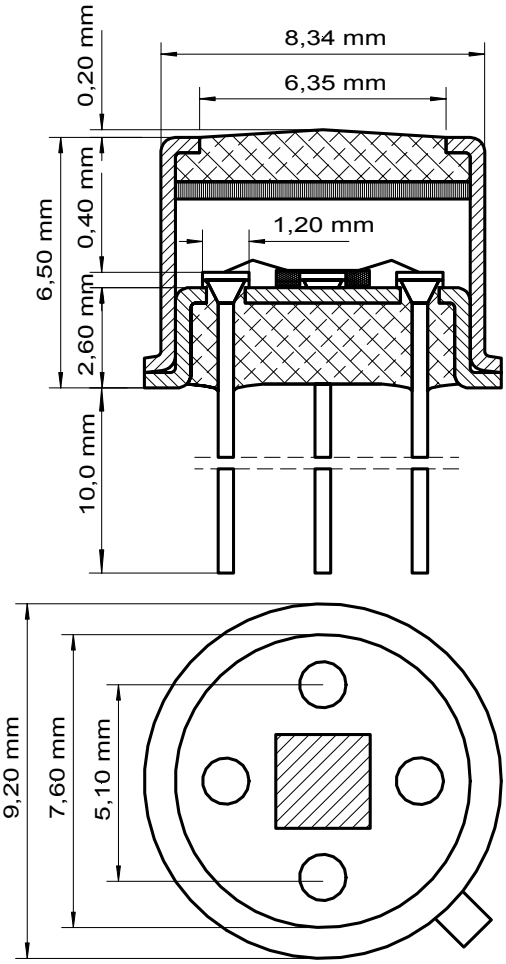
7. PACKAGE OVERVIEW



TO5 with transparent encapsulated plastic (MCS3AT)



TO5 with windows cap (MCS3BT)

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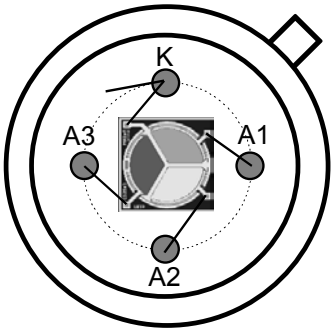
8. PIN-CONFIGURATION

(Top view)

PIN	description
1	A1 red
2	A2 blue
3	A3 green
K	common cathode

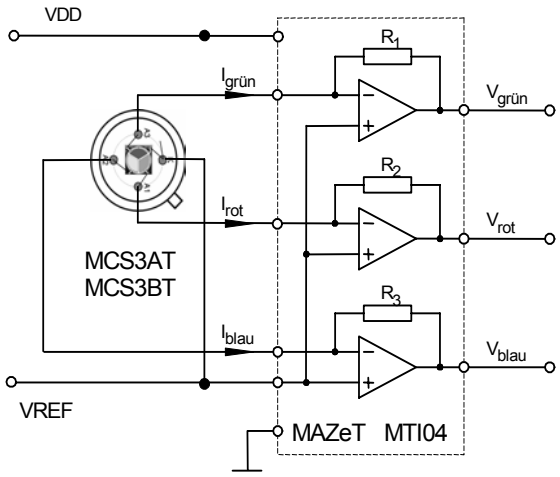


TO5-package

9. APPLICATION CIRCUIT

Opposite figure shows a circuit for the conversion of photo current to an equivalent voltage. These voltage can be processed e.g. with an ADC. By the selection of suitable resistors the output voltage range can be adjusted to the photo current value. (for example the pin-programmable transimpedance amplifier MTI04 with the resistors 25kΩ, 500kΩ and 5MΩ)

$$R_x \approx \frac{V_{Out}}{I_{Photo}}$$



10. APPLICATION NOTE

It is recommended to use an IR-block filter > 720nm (MCS3BT) or a light source with low infrared radiation for optimal operations of the color sensor.

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11. ORDERING INFORMATION

Color sensor with TO5-package, transparent encapsulated (plastic) **MCS3AT**
Color sensor with TO5-package, with top and IR-blocking windows **MCS3BT**
Evaluation board for JENCOLOR sensors **MCS-EB1**

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