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## Data Sheet

# MCS3AT/BT

### 3-element colour sensor – TO5

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## 1 FUNCTION

The colour 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 sensitised with dielectric spectral filter for its colour range, preferably for the primary colours red, green and blue.

## 2 APPLICATION

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



## 3 FEATURES

Dielectric filters guaranties the good optical properties of the colour 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)



## 4 CONSTRUCTION

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

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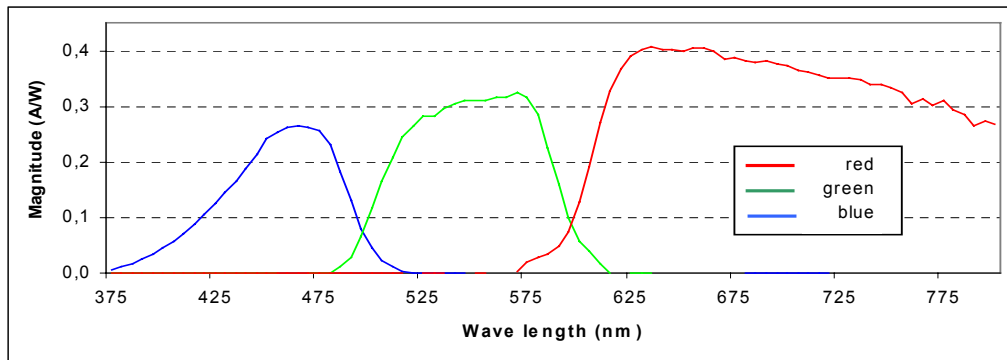
**5 MAXIMUM RATINGS / CHARACTERISTICS**

( $T_A = 25^\circ\text{C}$ ; per single diode)

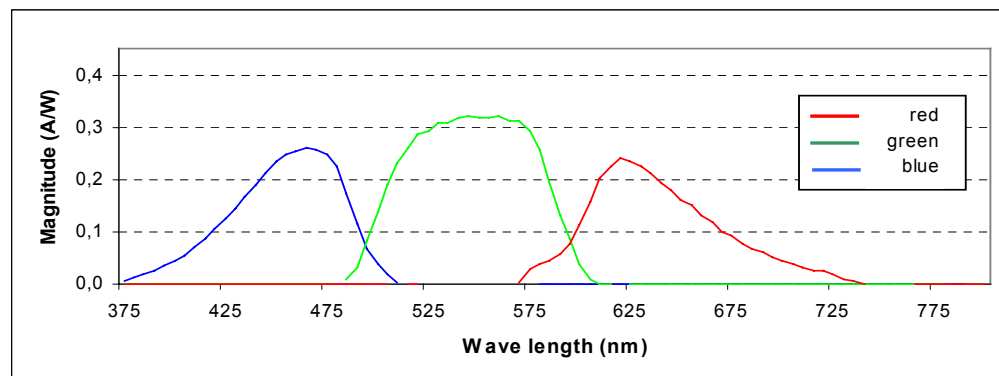
Description	Symbol	Condition	typ. Value	Unit
Diameter of the light sensitivity area	D		2,0	mm
Light sensitivity area per element	A		0,85	mm <sup>2</sup>
Photo sensitivity of colour ranges	$S_{max}$	$\lambda_B = 470 \text{ nm}$ $\lambda_G = 570 \text{ nm}$ $\lambda_R = 650 \text{ nm}$	0,26 0,33 0,41 (0,25)	A/W
Field of the spectral sensitivity $\pm 2\%*\lambda$	$\lambda_B$ $\lambda_G$ $\lambda_R$		400 - 510 490 - 610 590 - 750	nm
Reverse Voltage	$V_R$	0...5V	2,5	V
Dark current	$I_R$	$V_R = 5V$	<100	$\mu\text{A}$
Terminal Capacitance	C	$V_R = 5V$	50	pF
Rise and fall time of the photocurrent	$t_r, t_f$		<1	$\mu\text{s}$
Noise equivalent power	NEP	$f_R = 100 \text{ Hz}$	< $10^{-13}$	W/ $\sqrt{\text{Hz}}$
Crosstalk			1	%
Angle of incidence	$\varphi$	$\Delta\lambda_{(Filter)} < 1\%*\lambda$	8	Grad
Operating temperature range	$T_{op}$		0 ... +70	$^\circ\text{C}$
Storage temperature range	$T_{st}$		-20 ... +80	$^\circ\text{C}$

**6 CHARACTERISTIC CURVE**

**6.1 Typical spectral sensitivity of the 3-element colour sensor (MCS3AT)**



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



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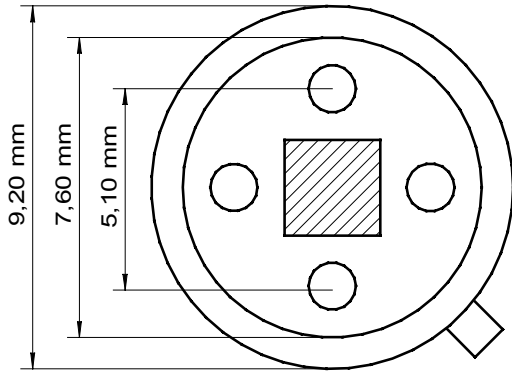
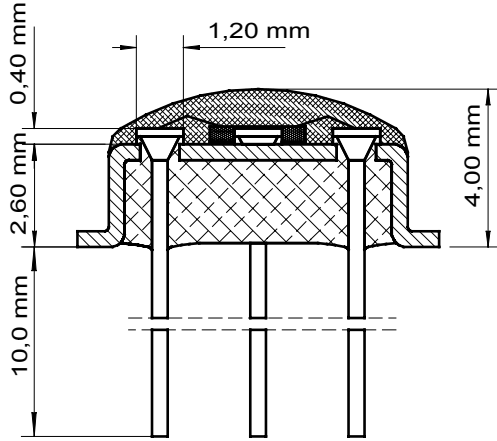
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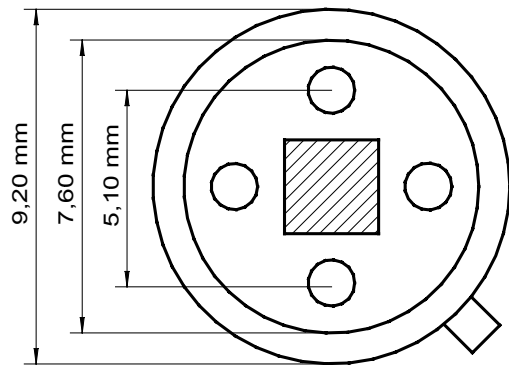
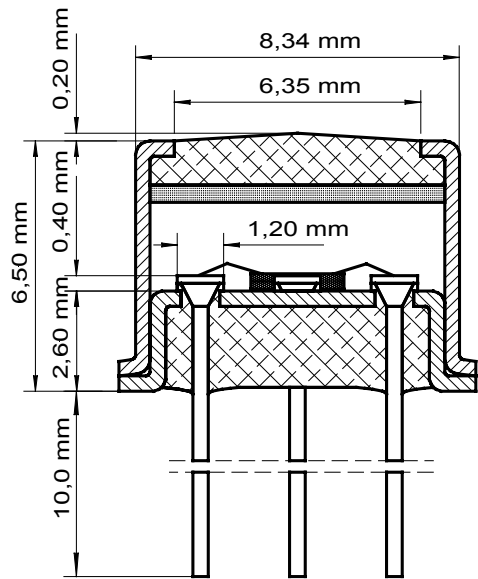
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**7 PACKAGE OVERVIEW**



TO5 with transparent encapsulated plastic (MCS3AT)



TO5 with windows cap (MCS3BT)

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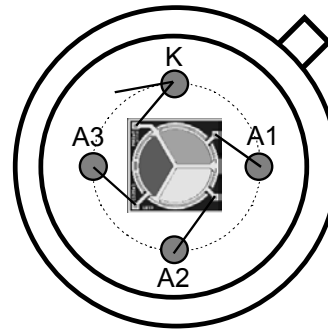
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**8 PIN-CONFIGURATION**

(Top view)

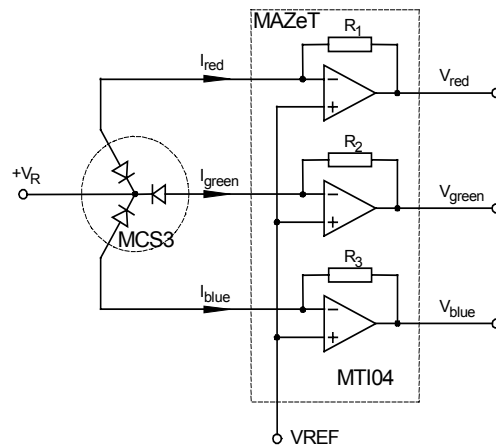
PIN	description
1	A1 red
2	A2 blue
3	A3 green
K	common cathode



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



$$R_x \approx \frac{V_{Out}}{I_{Photo}} \quad \text{resistors } 25k\Omega, 500k\Omega \text{ and } 5M\Omega$$

**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 colour sensor.

**11 ORDERING INFORMATION**

Colour sensor as Die	MCS3
Colour sensor with TO5-package, transparent encapsulated (plastic)	MCS3AT
Colour sensor with TO5-package, with top and IR-blocking windows	MCS3BT
Evaluation board for JENCOLOUR sensors	MCS-EB1

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