

DATA-SHEET

MCS3AO

3-element colour sensor – TO5 with optics

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.

APPLICATION

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

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)

CONSTRUCTION

- 3 on chip integrated PIN photo diodes
- package version TO5, with optical lense
- dielectric filters for the three colour ranges: red, green and blue
- Electrical connections
 - three anodes
 - one common cathode

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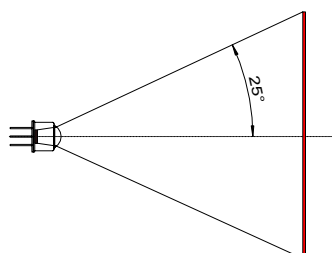
REVISIONS

REV.	DESCRIPTION	APPROVED
1	V1.1	2001/03/20

MAXIMUM RATINGS / CHARACTERISTICS

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

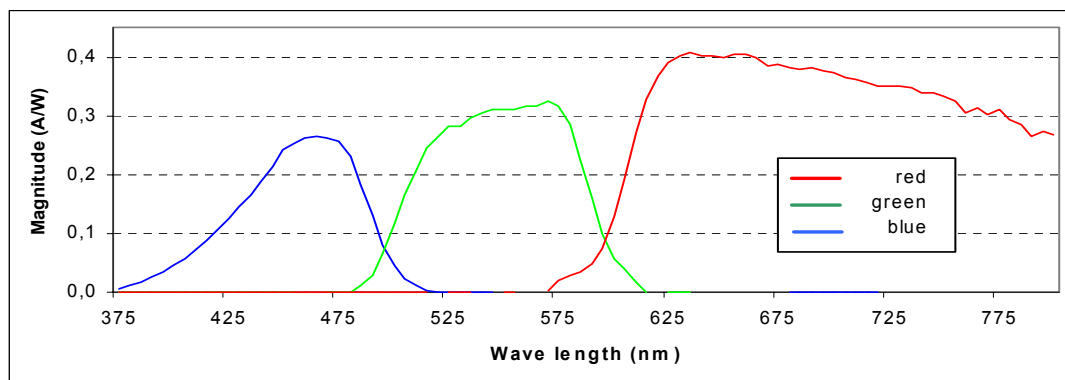
Description	Symbol	Condition	typ. Value	Unit
Diameter of the light sensitivity area	D		2,0	mm
Light sensitivity area per element	A		0,85	mm ²
Photo sensitivity of colour ranges	S_{\max}	$\lambda_B = 470 \text{ nm}$ $\lambda_G = 570 \text{ nm}$ $\lambda_R = 650 \text{ nm}$	0,26 0,33 0,41 (0,25)	A/W
Field of the spectral sensitivity $\pm 2\%*\lambda$	λ_B λ_G λ_R		400 - 510 490 - 610 590 - 750	nm
Reverse Voltage	V_R	0...3,5V	2,5	V
Dark current	I_R	$V_R = 5V$	<100	pA
Terminal Capacitance	C	$V_R = 5V$	50	pF
Rise and fall time of the photocurrent	t_r, t_f		<1	μs
Noise equivalent power	NEP	$f_R = 100 \text{ Hz}$	$<10^{-13}$	W/ $\sqrt{\text{Hz}}$
Crosstalk			1	%
Angle of incidence	ϕ	$\Delta\lambda_{(\text{Filter})} < 1\%*\lambda$	8	Grad
Operating temperature range	T_{op}		0 ... +70	$^\circ\text{C}$
Storage temperature range	T_{st}		-20 ... +80	$^\circ\text{C}$



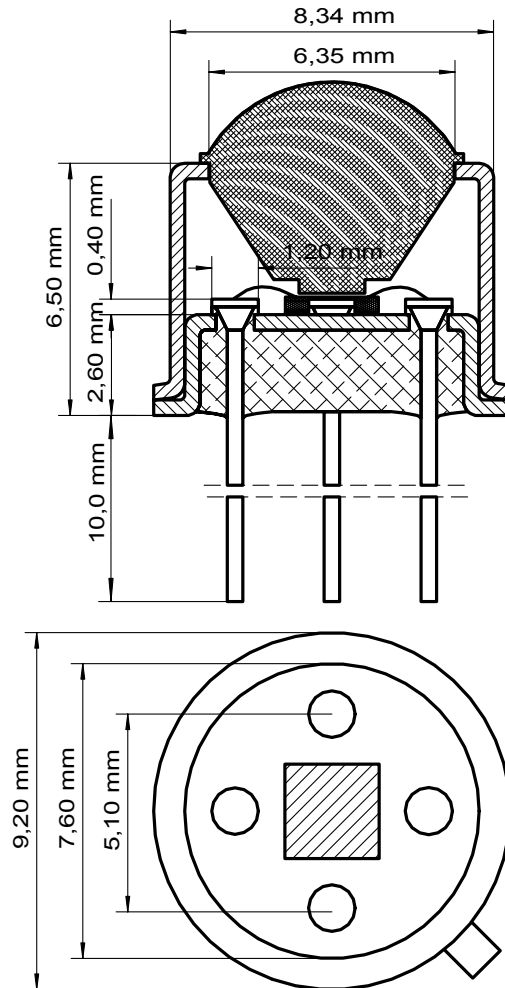
The optical lens allows the light collection at a acceptance angle width from 25° . In this case, the optimal work distance is 2 to 6 cm. The use of greater work distances is to be adapted by larger illumination intensity level.

CHARACTERISTIC CURVE

Typical spectral sensitivity of the 3-element colour sensor (MCS3)



PACKAGE OVERVIEW

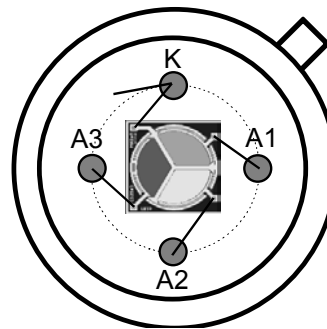


TO5 with optics (MCS3AO)

PIN-CONFIGURATION

(Top view)

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



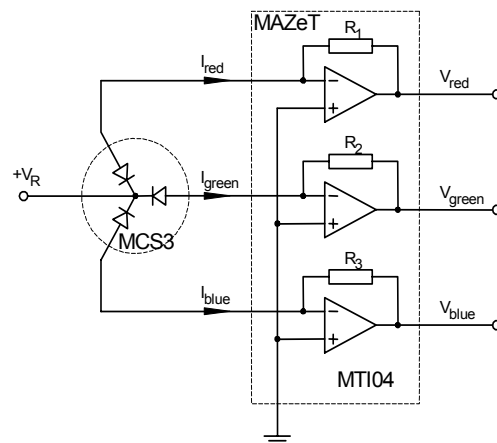
TO5-package

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 MT104 with the

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

resistors 25kΩ, 500kΩ and 5MΩ)



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.

ORDERING INFORMATION

Colour sensor with TO5-package with optical lens (plastic)
Evaluation board for JENCOLOUR sensors

MCS3AO
MCS-EB1