

## DATA-SHEET

### MCSi

#### Integral 3-Element Colour Sensor

##### 1. FUNCTION

The colour sensors are made of 19 x 3 Si-PIN photo diodes integrated on chip. They are carried out as a hexagonal matrix with the diameter of 3 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 have been separated from each other by additional structures. Each of these photodiodes is sensitized with dielectric spectral filter for its colour range, preferably for the primary colours red, green and blue.

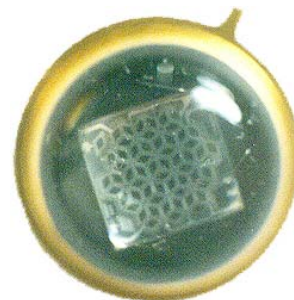
##### 2. APPLICATION

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

##### 3. FEATURES

Dielectric filters guarantee 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. 3 mm)
- insensitiveness to decentralized imaging, e. g. LWL coupling



##### 4. CONSTRUCTION

- 3 x 19 on chip integrated PIN photo diodes
- different package versions (TO5 with/without IR-blocking)
- dielectric filters for the three colour ranges: red, green and blue
- Electrical connections
  - three anodes
  - one common cathode

REVISIONS		
REV:	DISCRIPTION	APPROVED
1	V1.1	2001/02/21

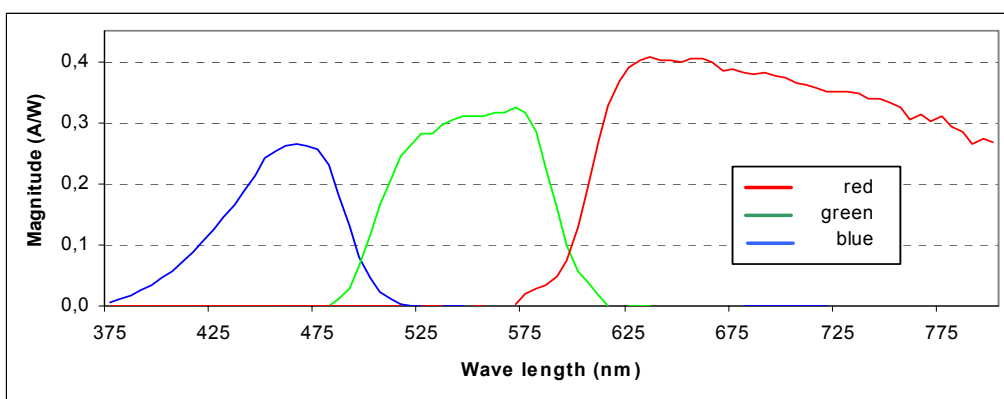
## 5. MAXIMUM RATINGS / CHARACTERISTICS

(TA = 25°C; per single diode)

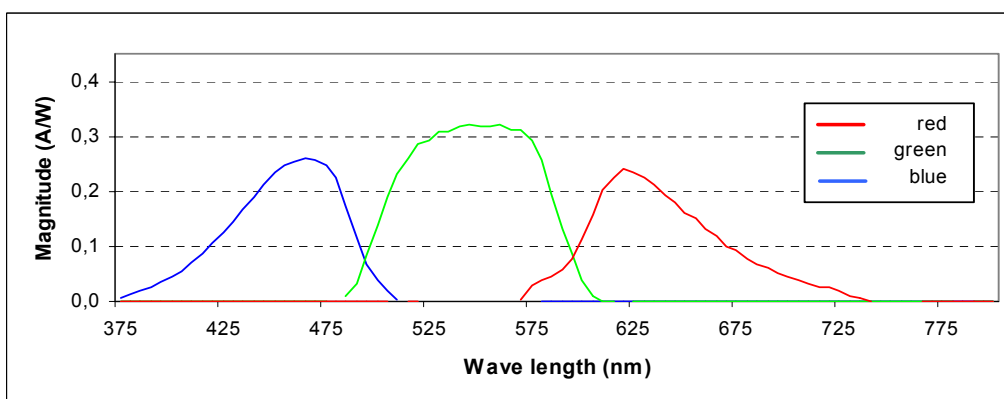
Description	Symbol	Condition	typ. Value	Unit
Diameter of the light sensitivity area	D		3,0	mm
Light sensitivity area per element	A		0,06	mm <sup>2</sup>
Photo sensitivity of colour ranges	S <sub>max</sub>	λ <sub>B</sub> = 470 nm λ <sub>G</sub> = 570 nm λ <sub>R</sub> = 650 nm	0,26 0,33 0,41 (0,25)	A/W
Photo sensitivity per colour	A		1,2	mm <sup>2</sup>
Field of the spectral sensitivity ± 2%*λ	λ <sub>B</sub> λ <sub>G</sub> λ <sub>R</sub>		400 - 510 490 - 610 590 - 750	nm
Reverse Voltage	V <sub>R</sub>		5	V
Dark current	I <sub>R</sub>	V <sub>R</sub> = 5V	<100	pA
Terminal Capacitance	C	V <sub>R</sub> = 5V	<100	pF
Rise and fall time of the photocurrent	t <sub>r</sub> , t <sub>f</sub>		<1	μs
Noise equivalent power	NEP		<10 <sup>-13</sup>	W/√Hz
Crosstalk			5	%
Angle of incidence	φ	Δλ <sub>(Filter)</sub> < 1%*λ	8	Grad
Operating temperature range	T <sub>op</sub>		0 ... +70	°C
Storage temperature range	T <sub>st</sub>		-20 ... +80	°C

## 6. CHARACTERISTIC CURVE

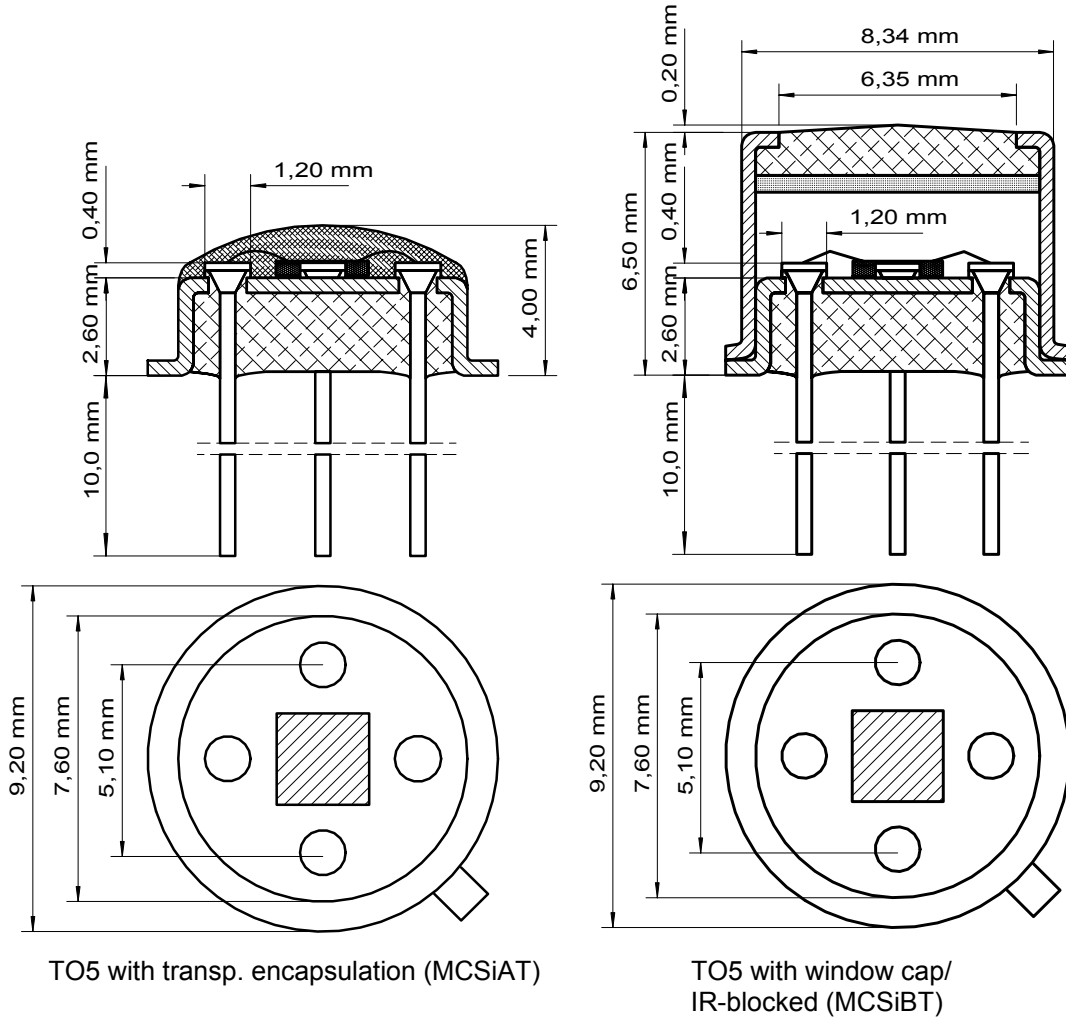
### 6.1 Typical spectral sensitivity of the integral colour sensor without IR-blocking



### 6.2 Typical spectral sensitivity of the integral colour sensor with IR-blocking



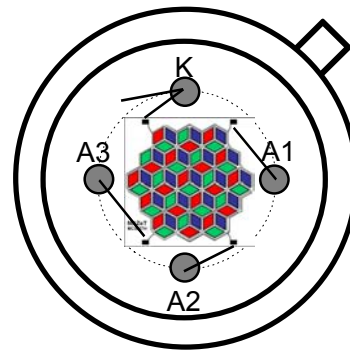
## 7. PACKAGE OVERVIEW



## 8. PIN-CONFIGURATION

(Top view)

PIN-	description
A1	red
A2	blue
A3	green
A4	common cathode

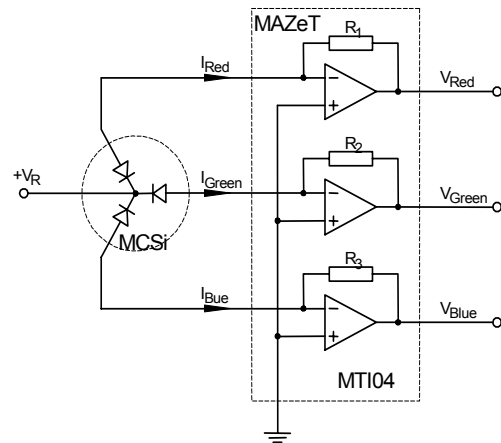


TO5-outline

## 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 MT104 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 or a light source with low infrared radiation for optimal operations of the colour sensor.

## 11. ORDERING INFORMATION

integral colour sensor MCSi as Die

integral colour sensor MCSi with TO5-package + transparent encapsulation

integral colour sensor MCSi with TO5-package + glas cap IR-blocked

Evaluation board for JENCOLOUR sensors

**MCSiAT**  
**MCSiBT**  
**MCS-EB1**