

| | | | |
|---|-----------|-------------|------------|
| The information disclosed herein was originated by and is the property of MAZeT. MAZeT reserves all patent, proprietary, design, use, sales, manufacturing and reproduction rights thereto. Product names used in this publication are for identification purposes only and may be trademark of their respective companies. | REVISIONS | | |
| | REV. | DESCRIPTION | APPROVED |
| | 1 | V 1.1 | 2004-10-13 |

Preliminary Data Sheet

MTCSiAO

Integral True Colour Sensor – TO5 with optics

Table of contents

1 FUNCTION 2

2 APPLICATION 2

3 FEATURES 2

4 CONSTRUCTION 2

5 ELECTRICAL CONNECTIONS..... 2

6 MAXIMUM RATINGS / CHARACTERISTICS..... 3

7 CHARACTERISTIC CURVE..... 3

8 PACKAGE OVERVIEW 4

9 PIN-CONFIGURATION 5

10 APPLICATION CIRCUIT 6

12 ORDERING INFORMATION 6

| | | | | |
|---|------------------|-------------|---------------------|-------------|
| MAZeT GmbH Sales Göschwitzer Straße 32 07745 JENA / GERMANY Phone: +49 3641 2809-0 Fax: +49 3641 2809-12 E-Mail: sales@MAZeT.de Url: http://www.MAZeT.de | Approvals | Date | MAZeT GmbH | |
| | Compiled: | 2004-10-07 | Status: preliminary | |
| | Checked: | 2004-10-13 | | |
| | Released: | 2004-10-13 | DOC. NO: DB-04-153e | Page 1 of 6 |

| REV. | DESCRIPTION | APPROVED |
|------|-------------|------------|
| 1 | V 1.1 | 2004-10-13 |

1 FUNCTION

The colour sensors are made of 19 x 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 new dielectric spectral filter (named True Colour Filter¹) 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
- Colour measurement

3 FEATURES

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

- high transmission
- slight ageing of the filter
- high temperature stability
- high signal frequency
- reduced cross talk
- small size (diameter of the optical sensitive surface ca. 2 mm)
- like tri-stimulus interference filter for colour measurement to DIN 5033 (&CIE LAB)

4 CONSTRUCTION

- 19 x 3 on chip integrated PIN photo diodes
- dielectric True Colour filters allow Colour Measurement to DIN 5033
- package version TO5, with optical lens
- TO metallic package (optional with optical lens and light-fibre coupling)

5 ELECTRICAL CONNECTIONS

- three anodes
- one common cathode

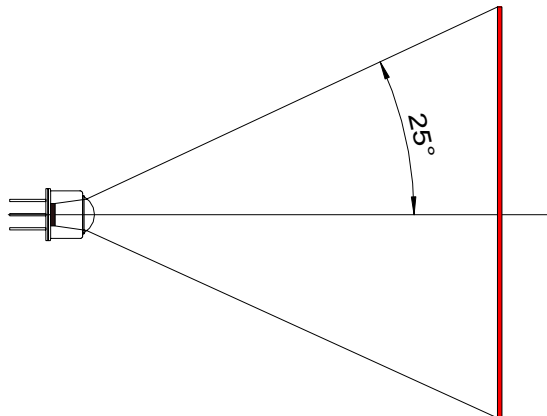
¹ The new generation of JENCOLOUR sensors is committed to implementing (see relative sensitivity) the standard distribution functions as defined under DIN 5033 Part 2 – Color Measurement; CIE 1931 Standard Colorimetric Systems. This implementation method allows colors to be determined according to the three-range procedure that is defined in part 6 of DIN 5033.

| REV. | DESCRIPTION | APPROVED |
|------|-------------|------------|
| 1 | V 1.1 | 2004-10-13 |

6 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} | $\lambda_Z = 445 \text{ nm}$ $\lambda_Y = 555 \text{ nm}$ $\lambda_{Xk} = 445 \text{ nm}$ $\lambda_{Xl} = 600 \text{ nm}$ | 0,24 0,33 0,14 0,35 | A/W |
| spectral tolerance of filter curve | $\Delta\lambda(\lambda)$ | | $<2\%*\lambda$ | nm |
| Reverse Voltage | V_R | 0...5V | 2,5 | V |
| Dark current | I_R | $V_R = 5\text{V}$ | <200 | pA |
| Terminal Capacitance | C | $V_R = 5\text{V}$ | <100 | pF |
| Rise and fall time of the photo-current | t_r, t_f | | <2 | μs |
| Noise equivalent power | NEP | $f_R = 100 \text{ Hz}$ | $<10^{-13}$ | W/ $\sqrt{\text{Hz}}$ |
| Cross-talk | | | <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 | $^\circ\text{C}$ |

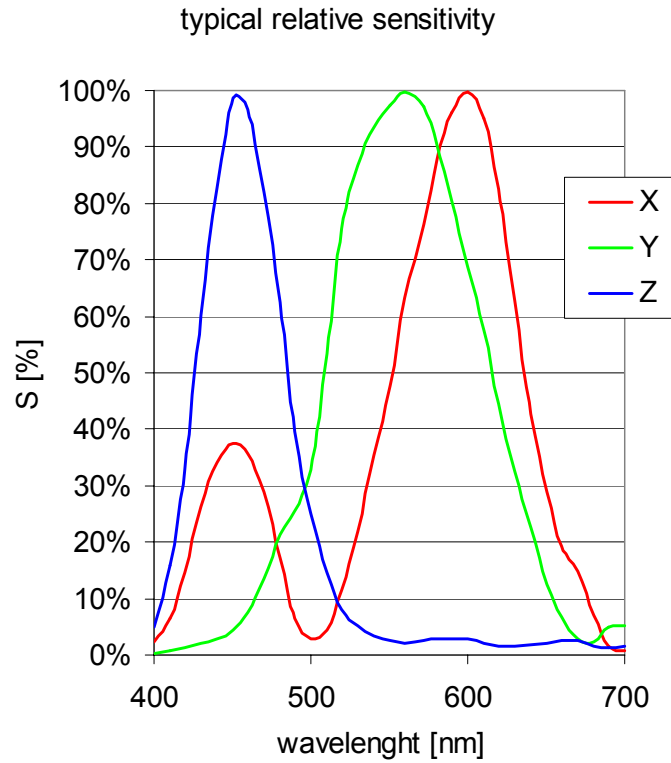


The optical lens allows the light collection at an acceptance angle width from 25° . In this case, the optimal work distance is 2 to 6 cm. The use of greater work distances is to be adapted by larger illumination intensity level.

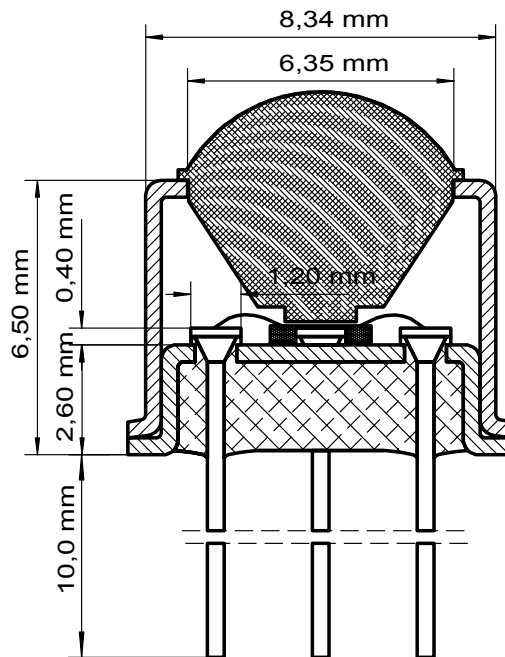
| REVISIONS | | |
|-----------|-------------|------------|
| REV. | DESCRIPTION | APPROVED |
| 1 | V 1.1 | 2004-10-13 |

7 CHARACTERISTIC CURVE

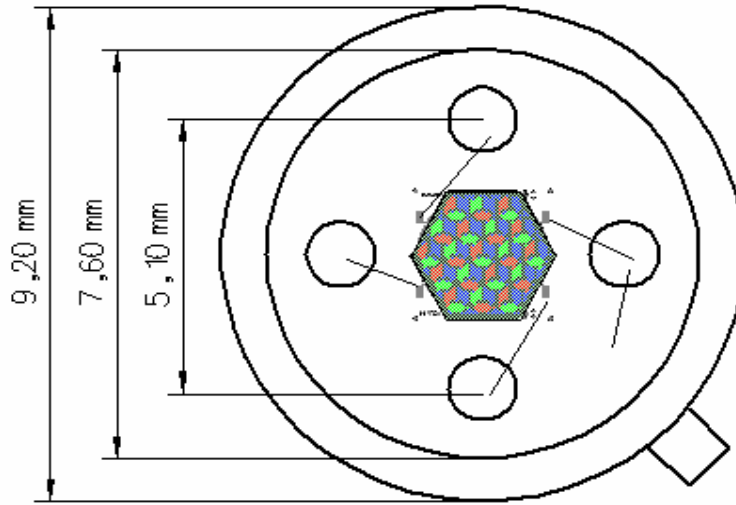
Typical (relative) sensitivity (XYZ) of the colour sensor (MTCSiAO)



8 PACKAGE OVERVIEW



| REV. | DESCRIPTION | APPROVED |
|------|-------------|------------|
| 1 | V 1.1 | 2004-10-13 |

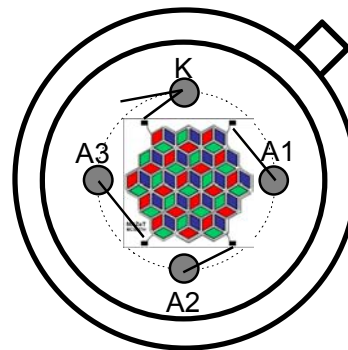


MTCSiAO in TO5 package with optics

9 PIN-CONFIGURATION

(Top view)

| PIN | description |
|-----|----------------|
| 1 | A1 X |
| 2 | A2 Z |
| 3 | A3 Y |
| K | common cathode |



TO5-package

Please note the different PIN-connections in our pre-series elements MTCSiAO and the series elements MTCSiCO (available in 11/2004).

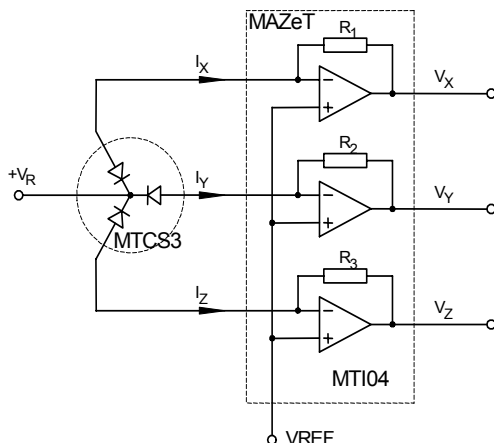
| REVISIONS | | |
|-----------|-------------|------------|
| REV. | DESCRIPTION | APPROVED |
| 1 | V 1.1 | 2004-10-13 |

10 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)

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



11 ORDERING INFORMATION

True Colour sensor with TO5-package and optics
 Modular application board modEVA
 Evaluation board for JENCOLOUR sensors

MTCSiAO
 modEVA
 MCS-EB1

For more detailed information please contact:

MAZeT GmbH
Sales office:
Frank Krumbein
 Göschwitzer Straße 32
 07745 JENA
 GERMANY
 Phone: +49 3641 2809-17
 Fax: +49 3641 2809-12
 E-Mail: krumbein@MAZeT.de
 Url: <http://www.MAZeT.de>