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Data Sheet

MTCSiCT

Integral True Color Sensor – TO39

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1. FUNCTION

The True Color Sensors are made of 19 x 3 photo diodes (special PIN silicon technology with extended sensibility) integrated on chip. The diodes are carried out as segments of a multiple-element hexagonal matrix structure 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 new dielectric spectral filter (named True Color Filter¹) for its color range, preferably for the primary **color standard CIE (Commission Internationale de l'Eclairage or International Commission on Illumination) color space.**

2. APPLICATION

- General Color measurements, checks and regulations
- Portable color reader for consumer and industrial applications
- Closed loop for RGB lighting (SSL) – regulation of temperature shifts
- Sensor for display color adjustment and backlight/contrast control
- Color sensitive sensor for “True Color” reproduction and system calibration
- Detector for various light sources, mood lighting, regulated color temperature



3. FEATURES

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

- high transmission
- no 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 color measurement to DIN 5033 (&CIE XYZ & La*b*)
- EU RoHS-conform²



¹ The new generation of JENCOLOR 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.

² EU RoHS: Directive 2002/95/EC of the European Parliament and of the Council of 27 January 2003 on the restriction of the use of certain hazardous substances in electrical and electronic equipment.

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4. MAXIMUM RATINGS / CHARACTERISTICS

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

Description	Symbol	Condition	min.	typ.	max.	Unit
Diameter of the light sensitivity area	D			2,0		mm
Light sensitivity area per single color array (19 diodes)	A			0,76		mm ²
Typical photo sensitivity of color ranges	S_{\max}	$\lambda_z = 445 \text{ nm}$	0,21	0,23	0,25	A/W
		$\lambda_y = 555 \text{ nm}$	0,30	0,33	0,36	
		$\lambda_{xk} = 445 \text{ nm}$	0,11	0,12	0,13	
		$\lambda_{xl} = 600 \text{ nm}$	0,31	0,35	0,38	
Spectral tolerance of filter curve	$\Delta\lambda(\lambda)$				$<1\%*\lambda$	nm
Reverse voltage	V_R		0	0	2,5	V
Dark current	I_R	$V_R = 2,5\text{V}$			10	pA
Terminal capacitance	C	$V_R = 2\text{V}$			70	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/ $\sqrt{\text{Hz}}$ z
Cross-talk					<1	%
Angle of incidence (see also chapter 11)	φ	$\Delta\lambda_{(\text{Filter})} < 1\%*\lambda$			10	Grad
Standard Operating temperatures ³	T_{op}		-20		+100	$^\circ\text{C}$
Storage temperature range	T_{st}		-40		+100	$^\circ\text{C}$
Soldering temperature	T	5 sec			240	$^\circ\text{C}$

³ special on request

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5. SPECTRAL CHARACTERISTIC

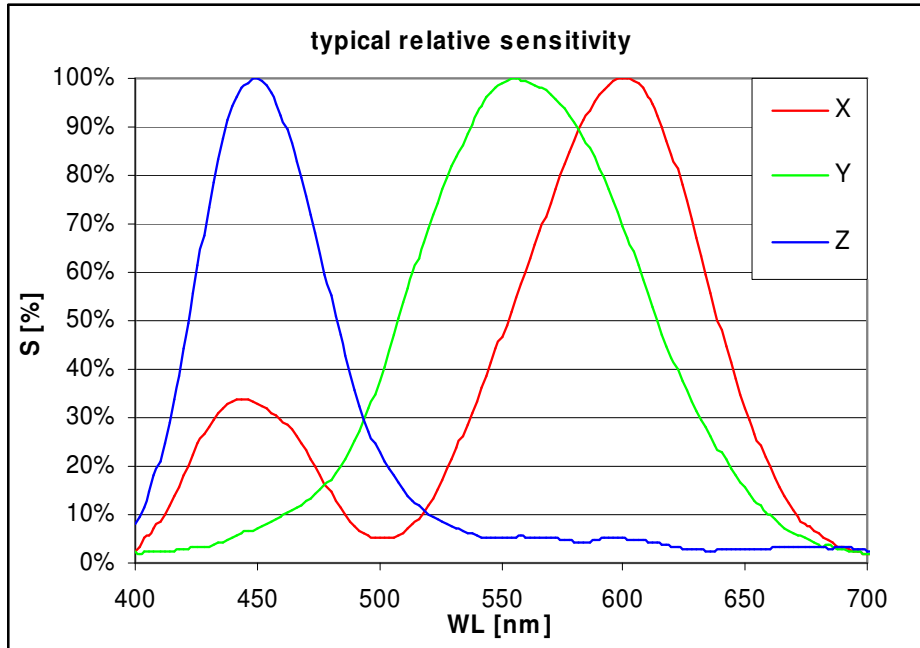


Figure: Typical (relative) sensitivity (XYZ) of the color sensor (MTCSiCT)^{4 5, 6}, scanned by width broadband light and limited angle of incidence (<10°)

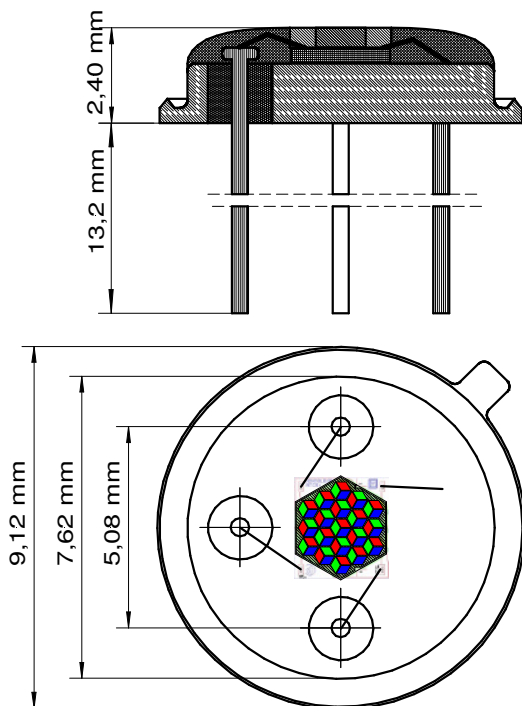
⁴ Typical characteristic sensitivity; scanned by monochromatic light with FWHM 27nm, see also chapter xyz

⁵ Please note, there are some technical differences between the national or international standards for color measurement based on the tri-stimulus observer function and our realized sensor function. Furthermore each sensor has small production based tolerances of nearly 1% variation referred to the wavelengths. So we recommend calibrating the sensor to achieve best results with a small error in the color space. The calibration depends on the different conditions - light source, color target, algorithm for calibration and all interferences hit the sensor. In most of cases it's possible to achieve always better results than human eyes. Please ask our technical staff for support if you want to calibrate your sensor system.

⁶ See chapter "Application notes – angle of incidence".

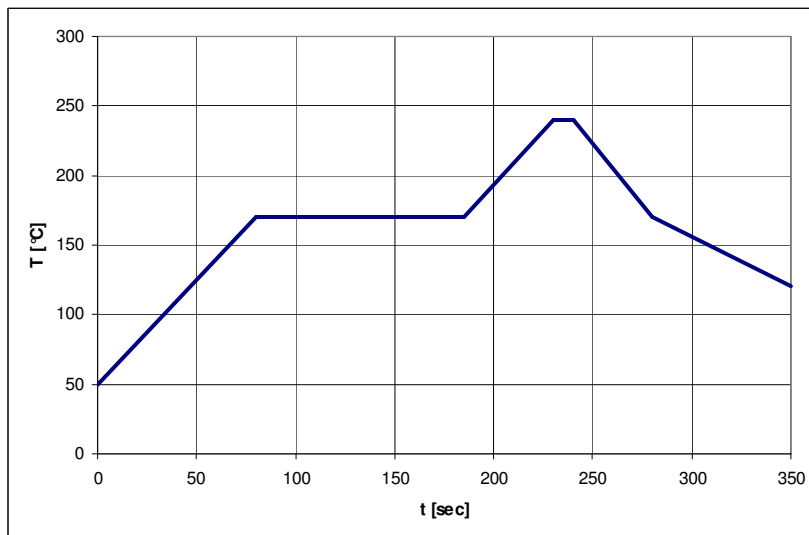
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6. PACKAGE OVERVIEW⁷



MTCSiCT in T39 package

7. SOLDERING PROFILE



Recommended Soldering Profile

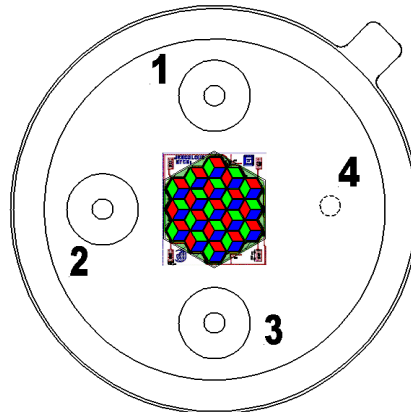
⁷ Please, protect the sensible surface (translucent globe top) of the sensor against scratch and similar mechanical injuries. It will have negative effects for the perfect function of the sensor.

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8. PIN-CONFIGURATION

(Top view)

PIN	description
1	Y (green)
2	Z (blue)
3	X (red)
4	common cathode



TO39-package

9. HANDLING AND STORAGE

Care should be taken to keep the sensor surface clean. Dust, scratches will adversely affect the sensor parameters. Sensors should be handled as optical device.

It is important to use normal ESD handling and precautions for ESD sensitive devices.

We recommend baking before soldering (24hours at 125°C).

10. PACKING INFORMATION

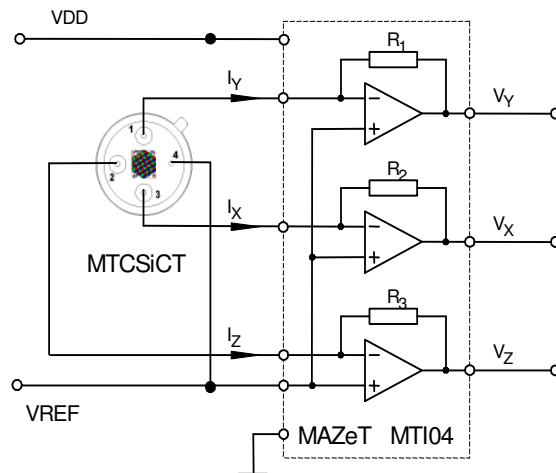
Standard packing's are small boxes with anti static foam. Otherwise has to be cleared with sales, see chapter 12.

11. APPLICATION CIRCUIT

11.1 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 MAZeT MTI04 with the resistors 25kΩ, 500kΩ and 5MΩ)

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



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11.2 LIMITATIONS

The spectral filters of our color sensors are specialized for applications with broadband source of lighting >10nm. Please ask our sales team before you use our sensor in combination with narrowband luminous sources.

11.3 Angle of incidence

In reliance on the packaging the sensor IC has an aperture angle (beam width) of nearly 90°. Traditional an interference filter works depends on angle of incidence. So a bumped light beam with different angles to vertical until 10° will not causes any filter shifts. Make sure by using lenses or optical holes that the angle of incidence for the sensor device will be smaller than 10°.

12. ORDERING INFORMATION

True Color sensor with TO39-package (available 03/2005)

MTCSiCT

For more detailed information please contact:

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