REVISIONS		
NO	VERSION	APPROVED
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Data Sheet

MTI04

MULTI-CHANNEL PROGRAMMABLE GAIN TRANSIMPEDANCE AMPLIFIER

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1. GENERAL DESCRIPTION

The MTI-devices are a family of integrated circuits of **programmable gain transimpedance amplifiers** with **different numbers of channels** (4 standard, others custom specific).

The MTI-devices are mainly used for **signal conditioning of sensors with current outputs**. They are especially suitable for connection of photodiodes of **array and row sensors**.

The possibility to **adjust the transimpedance in 3 stages** is a special feature.
The adjustment is made by programming two pins and is valid for all channels together.

The device packages are optimized for **COB-mounting**.

2. BLOCK DIAGRAM

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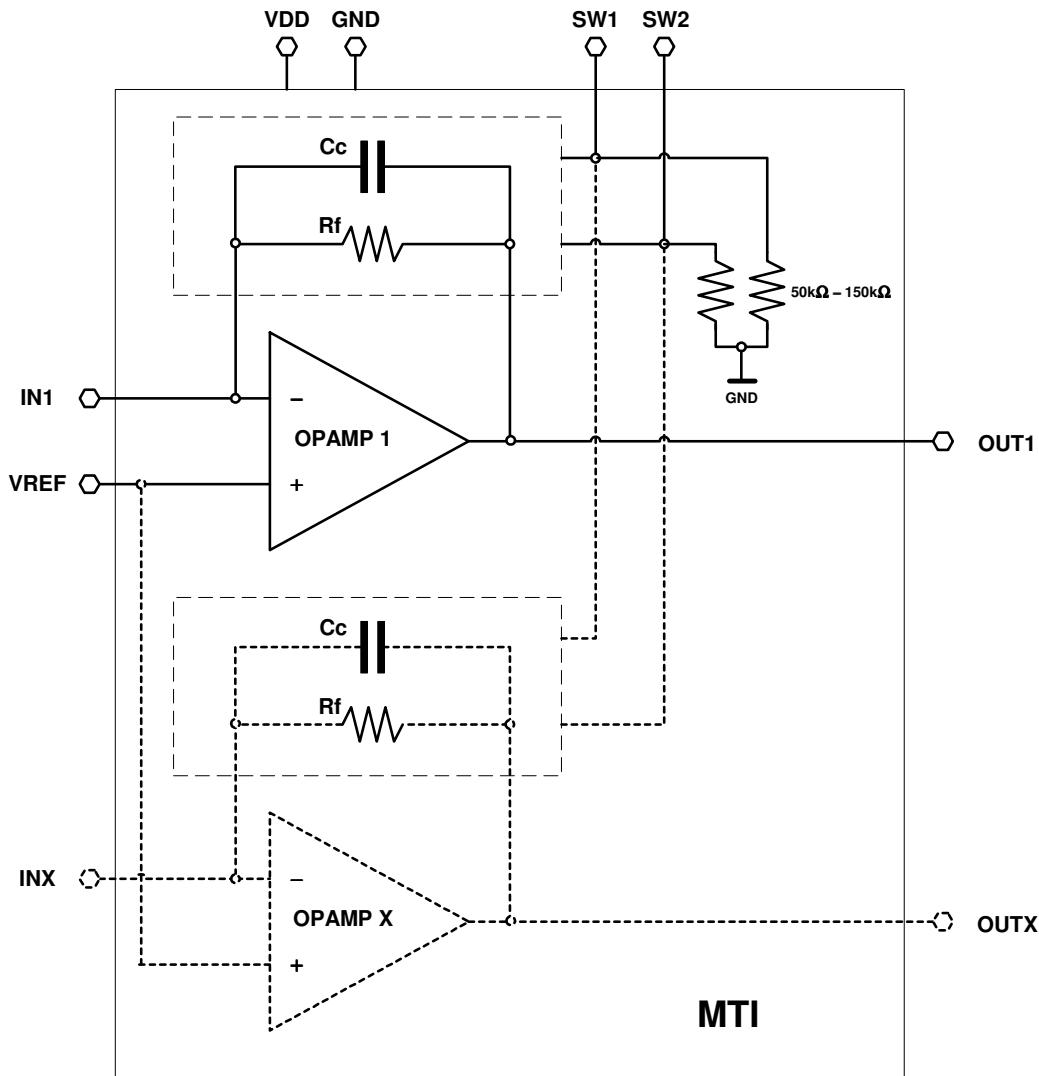
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3. DESCRIPTION OF INTERFACE

3.1 Pinning

signal name	Typ.	a/d[a]	function
VDD	input	a/d	power supply
GND	input	a/d	power supply
SW1	input	d	input 1 for adjustment of transimpedance of MTI-amplifier (pull down)
SW2	input	d	input 2 for adjustment of transimpedance of MTI-amplifier (pull down)
INX	input	a	analog current input of amplifier X
OUTX	output	a	analog voltage output of amplifier X

a.)   analog or digital

3.2 Adjustment Of Transimpedance

settings of digital inputs		transimpedance Rf
SW1	SW2	
GND	VDD	$5M\Omega$ – **stage 1**
VDD	GND	$500k\Omega$ – **stage 2**
GND	GND	$25k\Omega$[a] – **stage 3**
VDD	VDD	not used

a.)   default by pull down

4. DESCRIPTION OF FUNCTION

The MTI-devices are programmable gain transimpedance amplifiers with different numbers of channels (MTI04 – 4 channels). There is one transimpedance amplifier per channel between a current input INX and a voltage output OUTX. Its transimpedance is selectable in 3 stages. This adjustment can be effected by setting of digital inputs SW1 and SW2 and is valid for all channels simultaneously (headline 3.2). The inputs SW1 and SW2 are pulled down with a resistor for a default feedback resistor of 25k.

The second input of all transimpedance amplifiers is used for a *common* supply by a reference voltage necessarily fed in through the pin VREF.

All channels are compensated for an external input capacitance of the photo-sensor of typical 20pF.

The power supply for the MTI-devices is typical 5V between VDD and GND.

5. ELECTRICAL CHARACTERISTICS

5.1 Maximum Conditions

Violations of absolute maximum conditions are not allowed under any circumstances, otherwise the IC can be destroyed. All voltages are referenced to VSS = 0V.

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parameter	name	min.	max.	unit
power supply	VDD	0,3	7,0	V
input and output voltages	$\Rightarrow$ IC-pinning	0,3	VDD 0,3	V
power dissipation	P_{OP}		0,1	W
operating temperature	T_{OP}		85	°C
storage temperature	T_{STG}	55	155	°C

5.2 Operating Conditions

All voltages are referenced to VSS = 0V.

| parameter	name	min.	typ.	max.	unit	condition
supply voltage	VDD	4,5	5	5,5	V	
Bias current MTI04	I(VDD)	3		4	mA	27°C
operating temperature	T_{OP}	~	27	85	°C	
input high level	V_{IH}	2,0		VDD+0,3	V	
input low level	V_{IL}	0,3		0,8	V	
reference voltage	VREF	1	2,5	4	V	

5.3 AC/DC-Characteristics

Unless otherwise specified the data in this table is valid for T_{OP} = 27°C and VDD = 5V.

parameter	name	min.	typ.	max.	unit	condition
input current	INX		0,1		μA	stage 1
			1		μA	stage 2
			20		μA	stage 3
feedback resistor	Rf	4000	5000	6000	$k\Omega$	stage 1
		400	500	600	$k\Omega$	stage 2
		20	25	30	$k\Omega$	stage 3
signal frequency at input	f_{3dB}		25		kHz	stage 1
			70		kHz	stage 2
			500		kHz	stage 3
temperature coefficient of the feedback resistor	TC_{Rf}		3500		ppm/K	
input offset voltage	V_{OFF}			8	mV	T_{OP} = 85°C
input leakage current	I_{LEAK}			500	pA	T_{OP} = 85°C
capacitive load at OUTX	C_{LOAD}			50	pF	I_{LOAD} = 0,5mA
pull down resistor at SW1 and SW2	R_{PDSW}	50			k	
input capacitance of external connected photo-sensors	C_{DIODE}		20		pF	per input

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5.3.1 Offset Voltage At Input INX

Offset Voltage Voff = f(VREF) -- Temp = 0℃
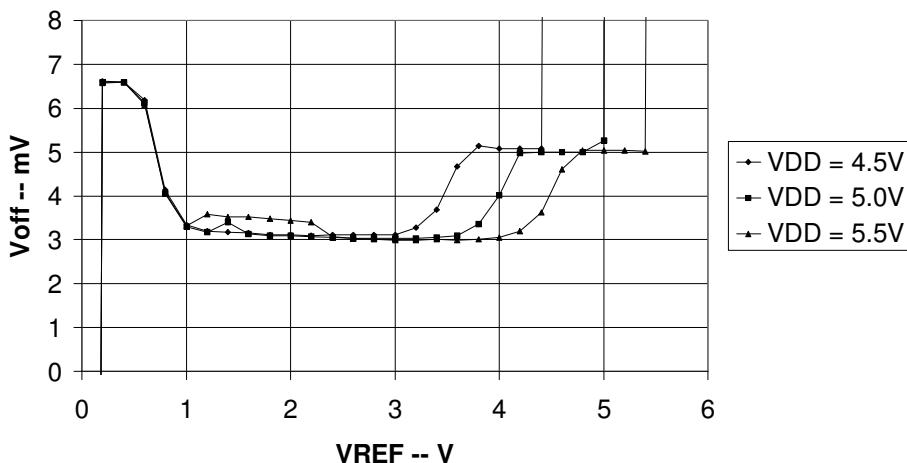
Offset Voltage Voff = f(VREF) -- Temp = 27℃
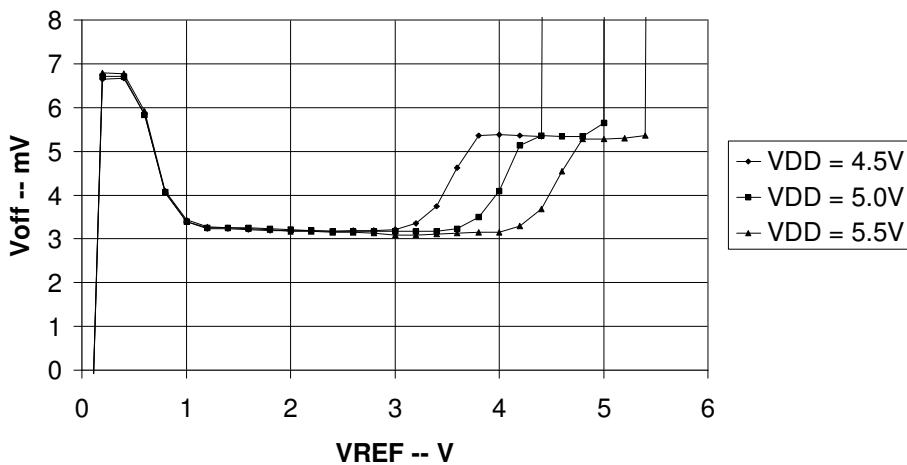
Offset Voltage Voff = f(VREF) -- Temp = 85℃
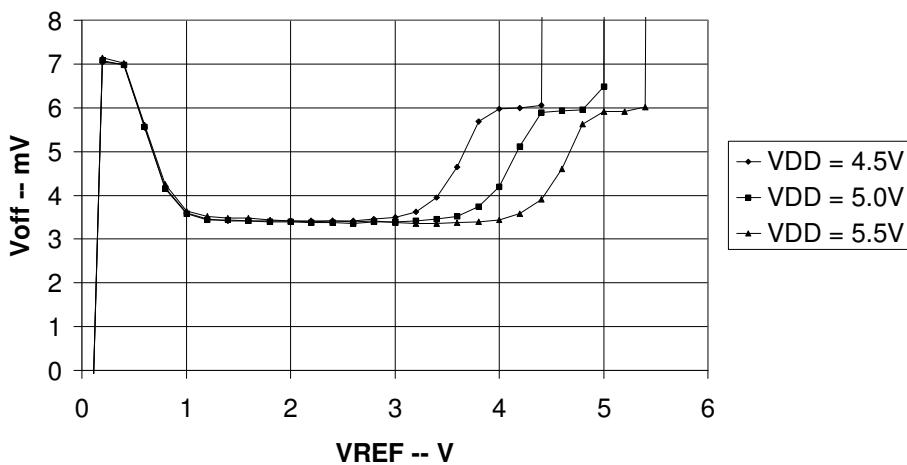
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5.3.2 Leakage Current At Input INX

Leakage Current Ileak = f(VREF) -- Temp = 0℃
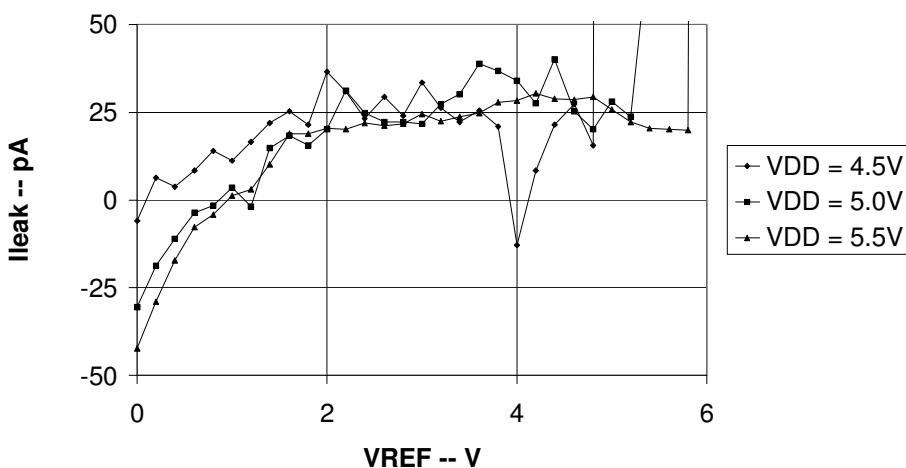
Leakage Current Ileak = f(VREF) -- Temp = 27℃
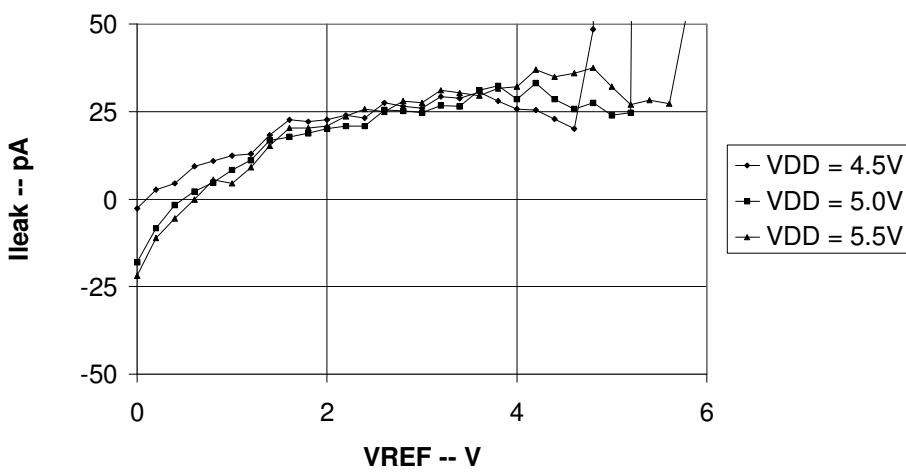
Leakage Current Ileak = f(VREF) -- Temp = 85℃

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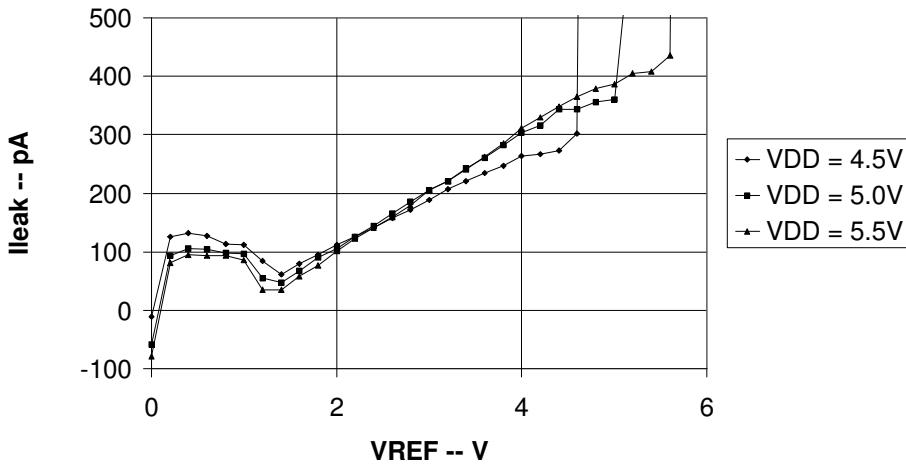
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5.3.3 DC-Transfer-Curves

DC-Transfer-Curve V(OUTX) = f(I(INX)) -- Rf = 25kOhms
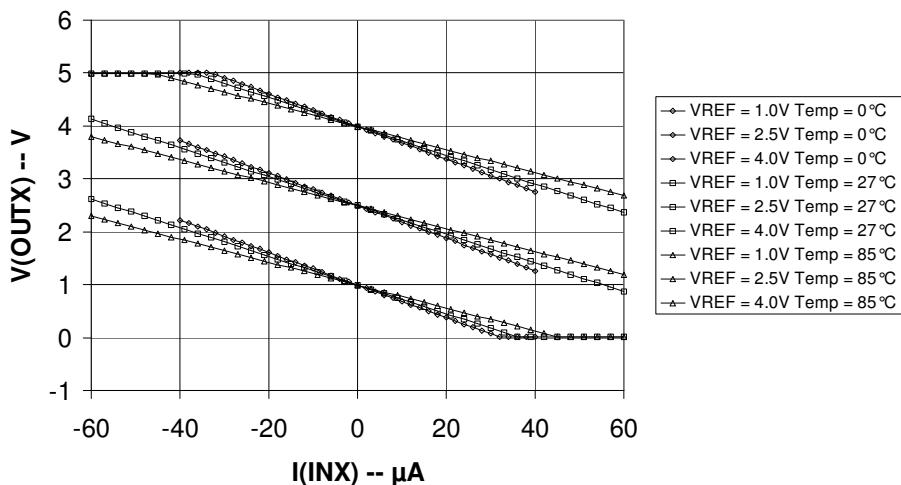
DC-Transfer-Curve V(OUTX) = f(I(INX)) -- Rf = 500kOhms
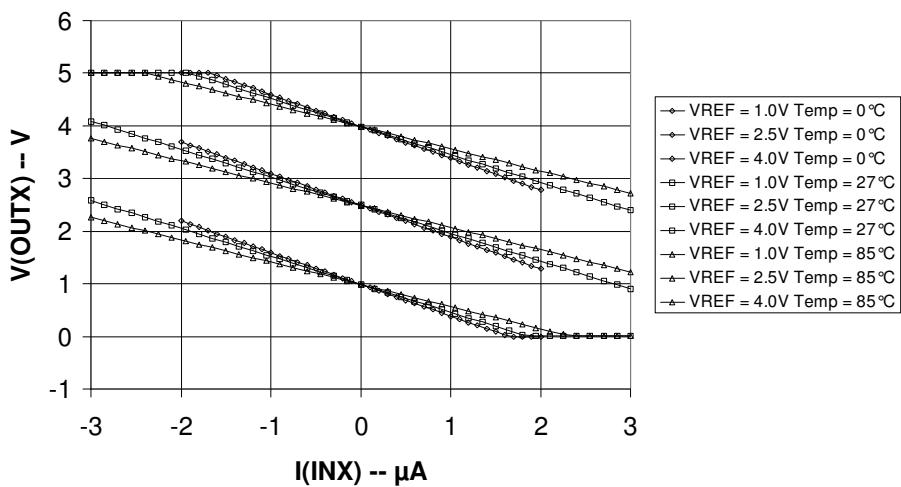
DC-Transfer-Curve V(OUTX) = f(I(INX)) -- Rf = 5MOhms
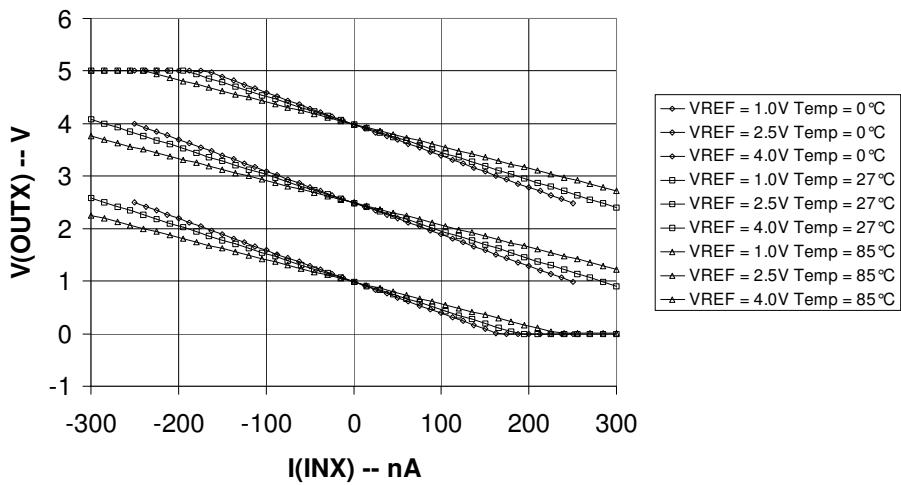
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6. PACKAGES

6.1 Shape and Dimensions

tapered edge[1]
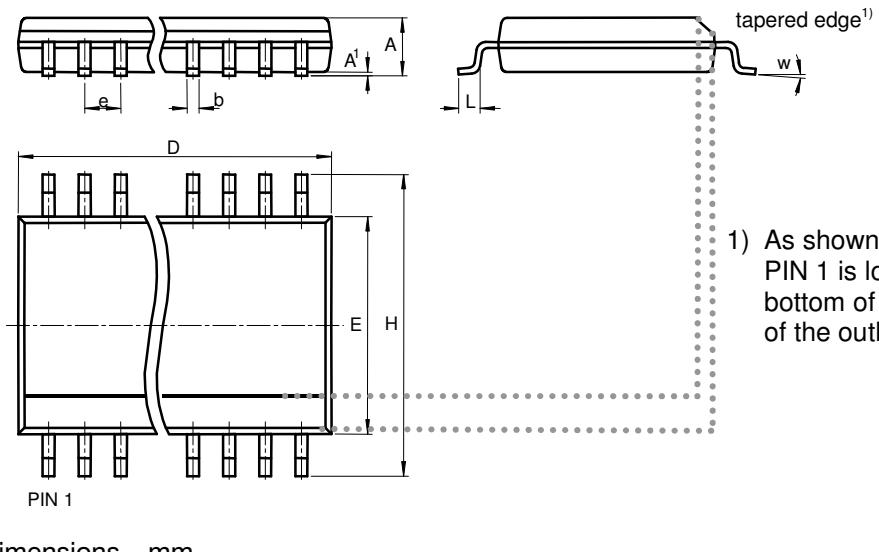
1) As shown in the figure PIN 1 is located on the bottom of the left corner of the outline.

PIN 1

dimensions − mm

TYP	PACKAGE	D	E	H	A	A1	e	b	L	w
MTI04BS	SOP16	9,90	3,80	6,00	1,75	0,15	1,27	0,41	0,72	4°
MTI04BQ	QSOP16	4,90	3,80	6,00	1,75	0,15	0,635	0,38	0,72	4°

6.2 Pin-Configuration

		MTI04Bx		
VREF	1		16	SW2
SW1	2	TOP VIEW (not to scale)	15	VDD
GND	3		14	NC
IN1	4	SOP16 QSOP16	13	OUT1
IN2	5		12	OUT2
IN3	6		11	OUT3
IN4	7		10	OUT4
NC	8	$R_f = f(SW1, SW2)$	9	NC

NNC = Not connected

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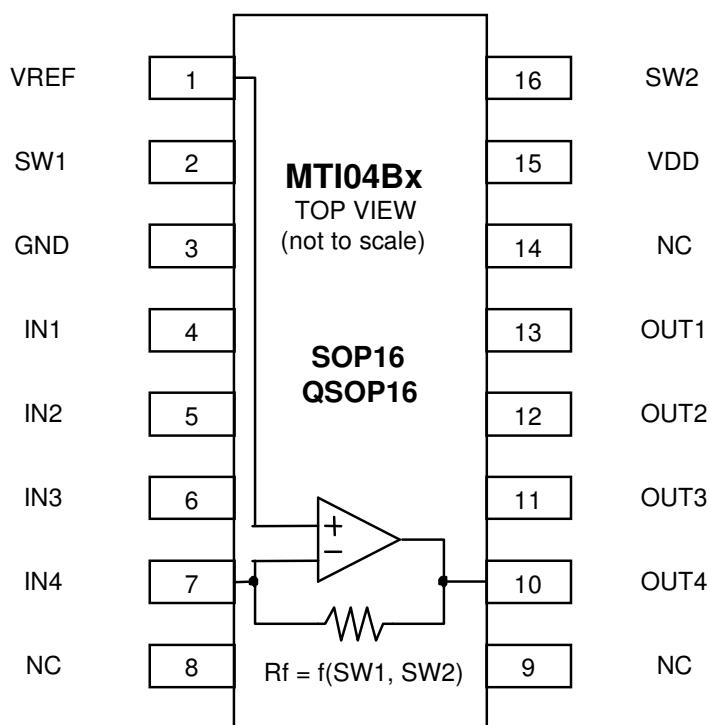
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7. APPLICATIONS

7.1 Example For Position Measurement

LIGHT SOURCE

MOVING APERTURE

PHOTO SENSOR ROW

PHOTO CURRENT

Rf − + **MTI08 transimpedance amplifier**

OUTPUT VOLTAGE

A/D-CONVERTER

DATA STREAM

LOGIC FOR SIGNAL PROCESSING
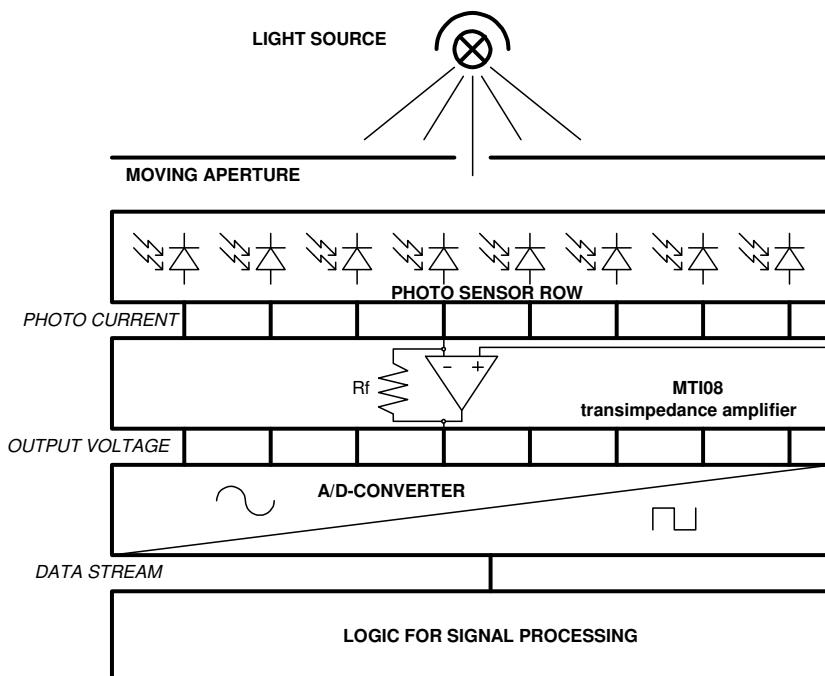
7.2 Connection Of A Colour Sensor

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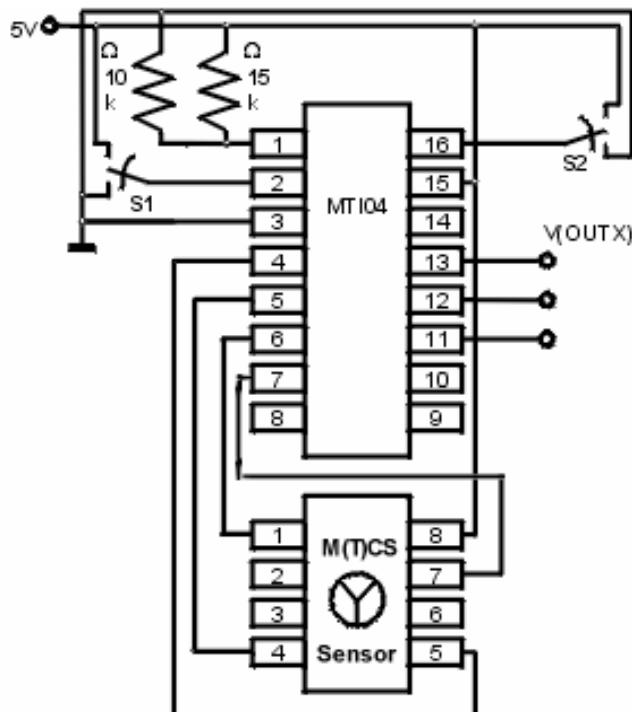
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8. ORDERING INFORMATION

NAME OF PRODUCT   PACKAGE   NUMBER OF CHANNELS

MTI04BS[1] (or MTI04BS-BF)   SOP16   4
MTI04BQ[2] (or MTI04BQ-BF)   QSOP16   4

Please note, our components with "−BF" in type or name are RoHS conform and perhaps require adaptations for the soldering technology.

9. CONTACT

For further information, please feel free to contact:

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[1] will be replaced by MTI04BS-BF: compatible in function and outline, but ROHS conform
[2] will be replaced by MTI04BQ-BF: compatible in function and outline, but ROHS conform

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