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	1	V 1.5	2003-07-07

## Data Sheet

# MTI04Bx / MTI08Bx

## MULTI-CHANNEL PROGRAMMABLE GAIN TRANSIMPEDANCE AMPLIFIER

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	Compiled:	2003-07-07	Status: valid	
	Checked:	2003-07-07		
	Released:	2003-07-07	DOC. NO: DB-99-072e	Page 1 of 10

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## 1. GENERAL DESCRIPTION

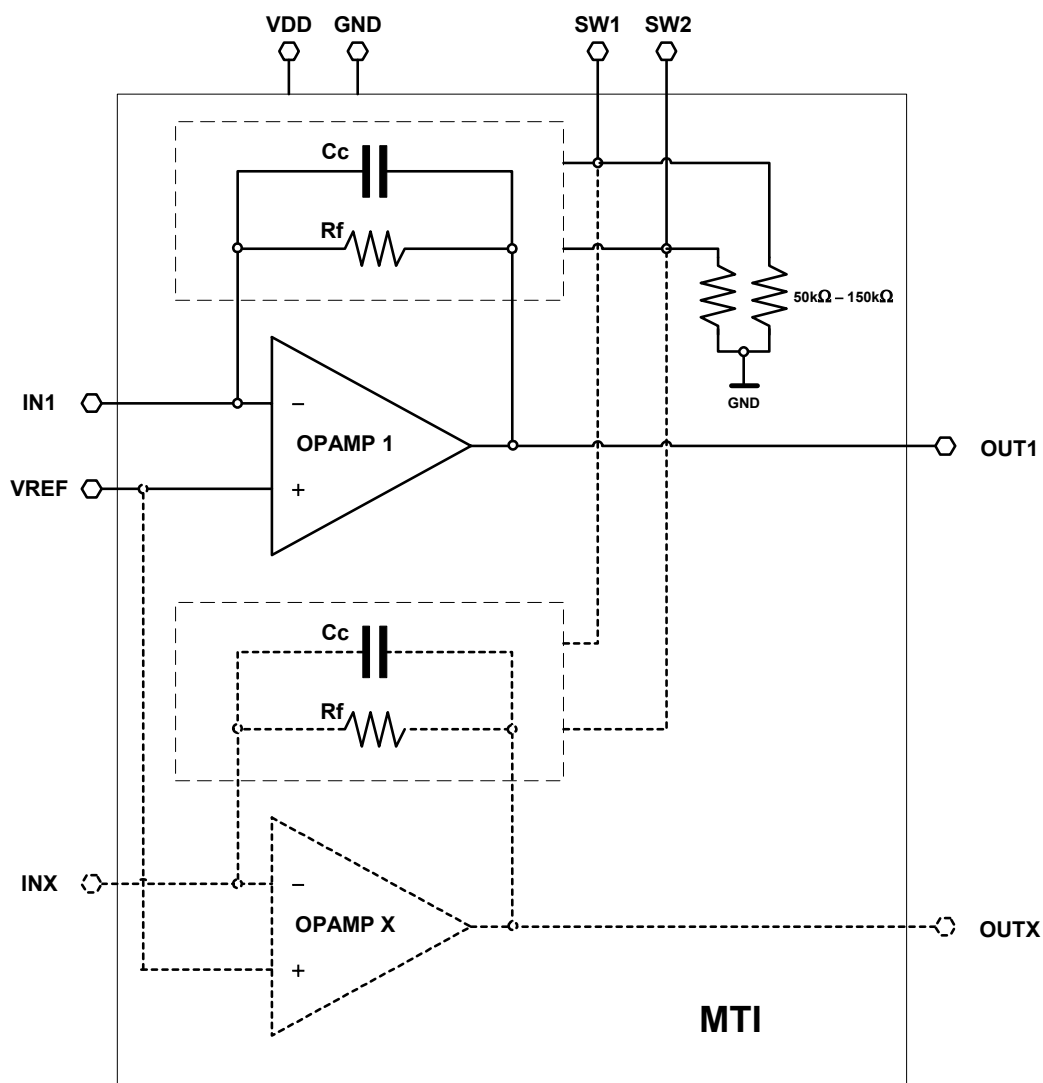
The MTI-devices are a family of integrated circuits of **programmable gain transimpedance amplifiers** with **different numbers of channels** (4 or 8).

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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### 3. DESCRIPTION OF INTERFACE

#### 3.1 Pinning

signal name	Typ.	a/d <sup>a</sup>	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 R <sub>f</sub>
SW1	SW2	
GND	VDD	5M $\Omega$ – <b>stage 1</b>
VDD	GND	500k $\Omega$ – <b>stage 2</b>
GND	GND	25k $\Omega$ <sup>a</sup> – <b>stage 3</b>
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; MTI08 – 8 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 Absolute Maximum Ratings

Violations of absolute maximum ratings are not allowed under any circumstances. All voltages are referenced to VSS = 0V.

parameter	name	min.	max.	unit
power supply	VDD	0,3	7,0	V
input and output voltages	⇒ IC-pinning	0,3	VDD 0,3	V
power dissipation	P <sub>OP</sub>		0,1	W
operating temperature	T <sub>OP</sub>		85	°C
storage temperature	T <sub>STG</sub>	55	155	°C

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## 5.2 Operating Conditions

All voltages are referenced to  $V_{SS} = 0V$ .

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
Bias current MTI08	I(VDD)	12		16	mA	27°C
operating temperature	T <sub>OP</sub>		27	85	°C	
input high level	V <sub>IH</sub>	2,0		VDD+0,3	V	
input low level	V <sub>IL</sub>	0,3		0,8	V	
reference voltage	VREF	1	2,5	4	V	

## 5.3 AC/DC-Characteristics

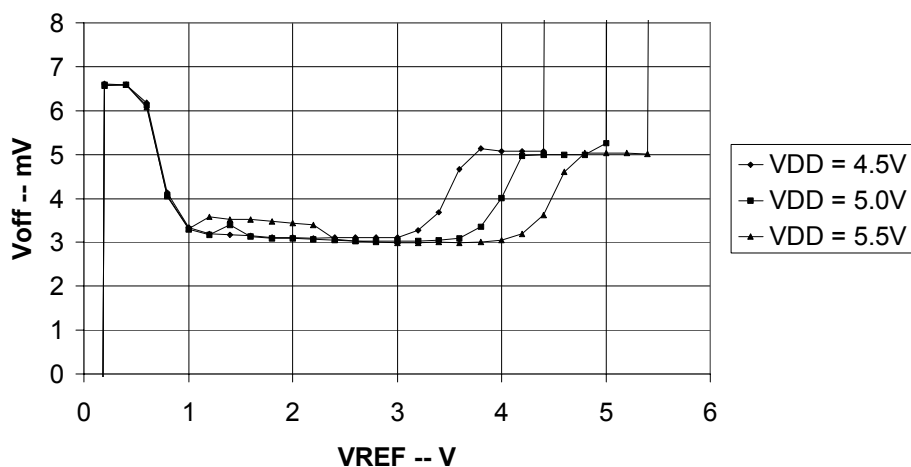
Unless otherwise specified the data in this table is valid for T<sub>OP</sub> = 27°C and VDD = 5V.

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	R <sub>f</sub>	4000	5000	6000	kΩ	stage 1
		400	500	600	kΩ	stage 2
		20	25	30	kΩ	stage 3
signal frequency at input	f <sub>3dB</sub>		25		kHz	stage 1
			70		kHz	stage 2
			500		kHz	stage 3
temperature coefficient of the feedback resistor	TC <sub>Rf</sub>		3500		ppm/K	
input offset voltage	V <sub>OFF</sub>			8	mV	T <sub>OP</sub> = 85°C
input leakage current	I <sub>LEAK</sub>			500	pA	T <sub>OP</sub> = 85°C
capacitive load at OUTX	C <sub>LOAD</sub>			50	pF	I <sub>LOAD</sub> = 0,5mA
pull down resistor at SW1 and SW2	R <sub>PDSW</sub>	50			k	
input capacitance of external connected photo-sensors	C <sub>DIODE</sub>		20		pF	per input

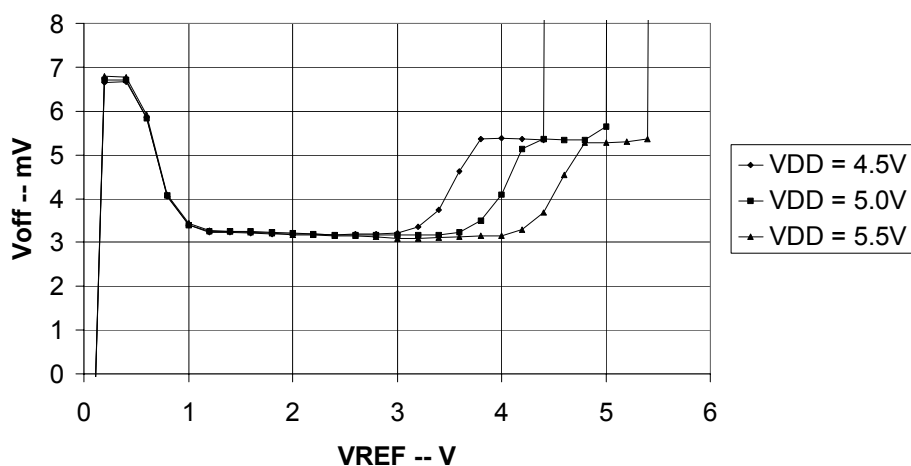
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### 5.3.1 Offset Voltage At Input INX

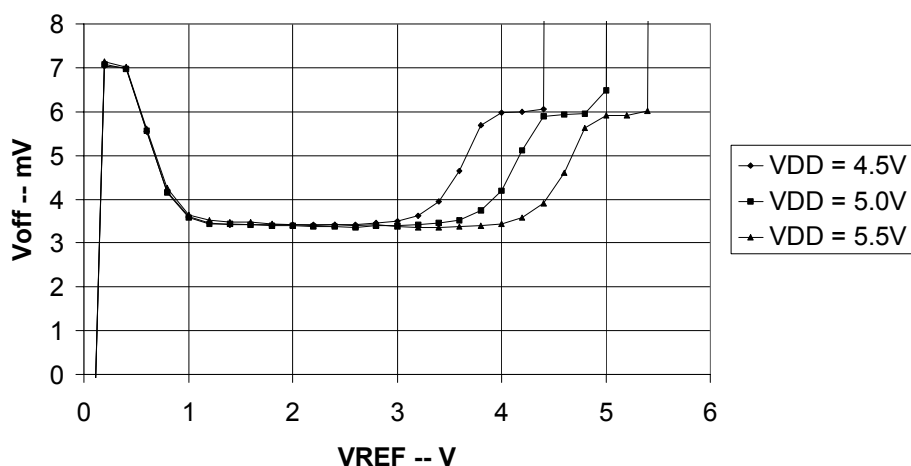
Offset Voltage  $V_{off} = f(V_{REF})$  -- Temp = 0°C



Offset Voltage  $V_{off} = f(V_{REF})$  -- Temp = 27°C



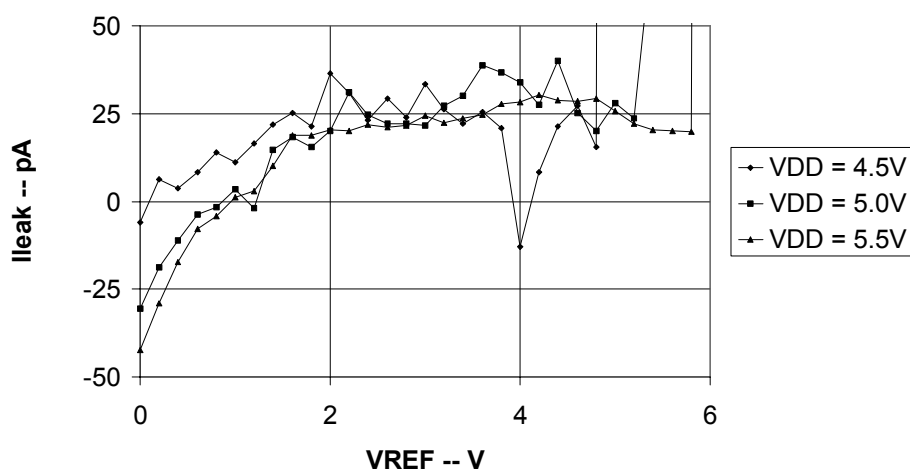
Offset Voltage  $V_{off} = f(V_{REF})$  -- Temp = 85°C



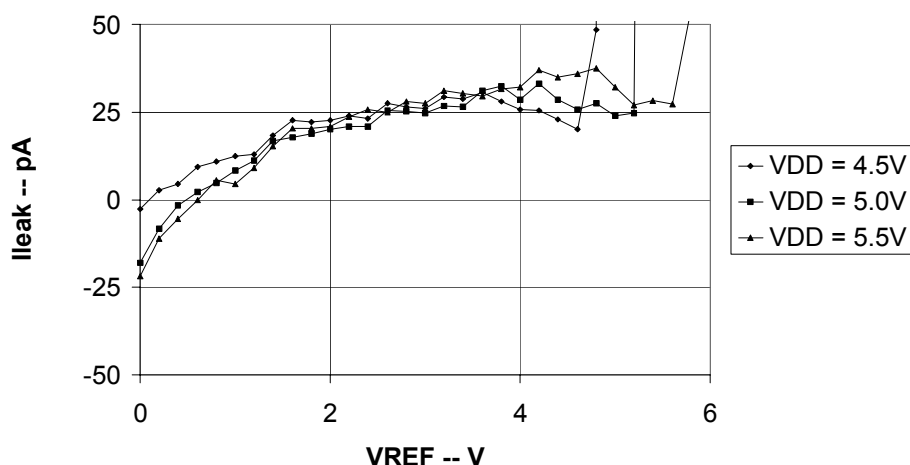
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### 5.3.2 Leakage Current At Input INX

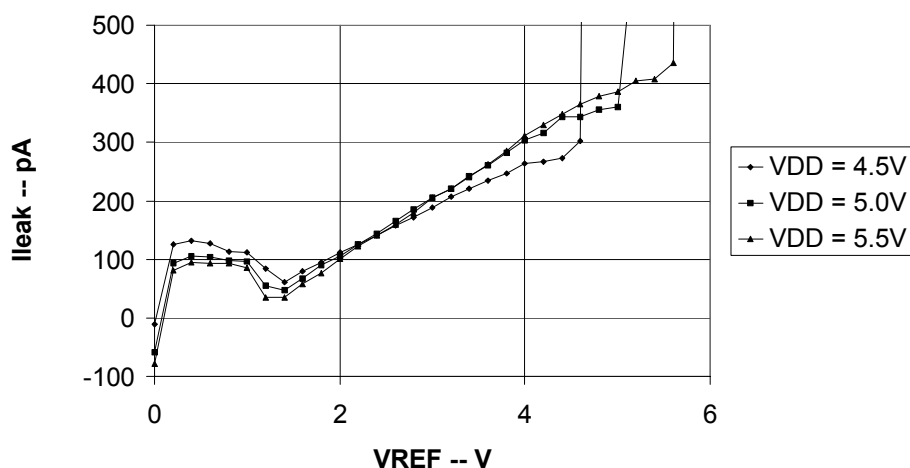
Leakage Current  $I_{leak} = f(V_{REF})$  -- Temp = 0°C



Leakage Current  $I_{leak} = f(V_{REF})$  -- Temp = 27°C

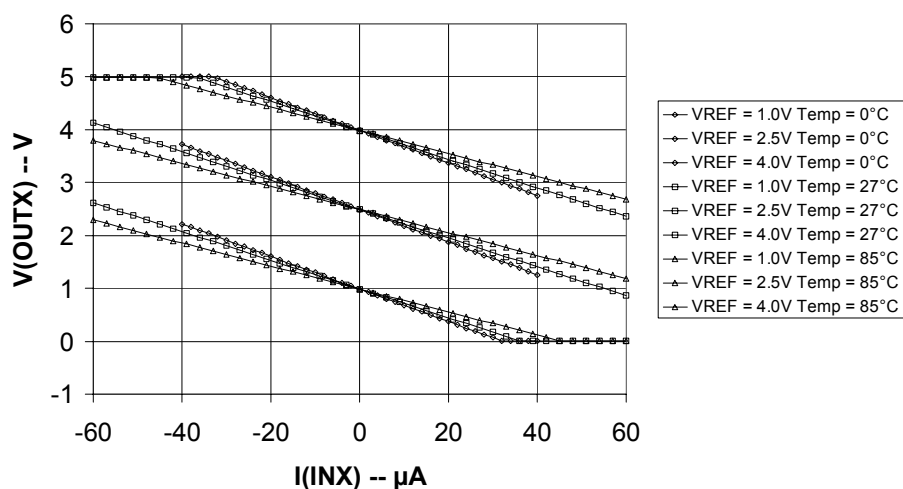
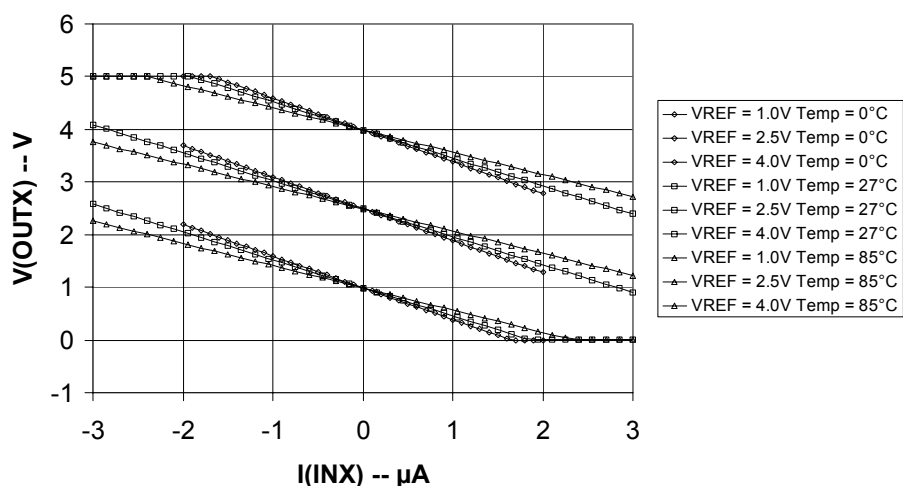
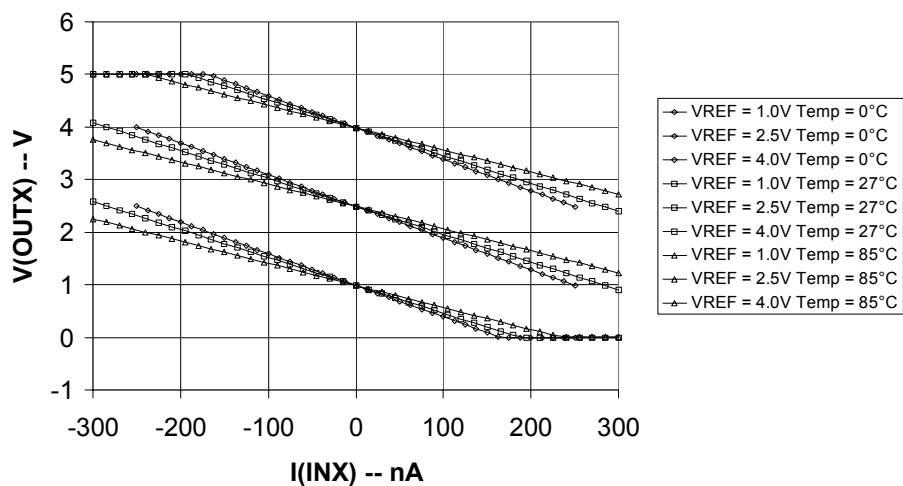


Leakage Current  $I_{leak} = f(V_{REF})$  -- Temp = 85°C



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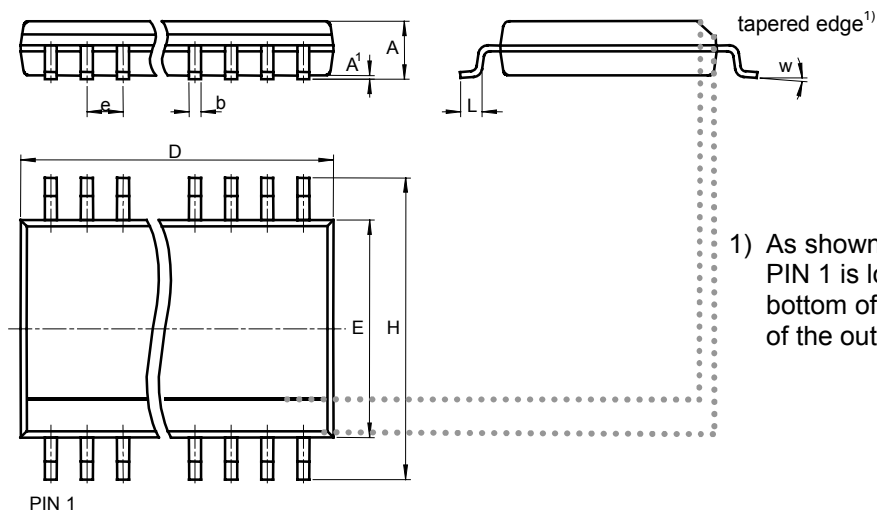
## 5.3.3 DC-Transfer-Curves

DC-Transfer-Curve  $V(\text{OUTX}) = f(I(\text{INX}))$  --  $R_f = 25\text{k}\Omega$ DC-Transfer-Curve  $V(\text{OUTX}) = f(I(\text{INX}))$  --  $R_f = 500\text{k}\Omega$ DC-Transfer-Curve  $V(\text{OUTX}) = f(I(\text{INX}))$  --  $R_f = 5\text{M}\Omega$ 

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## 6. PACKAGES

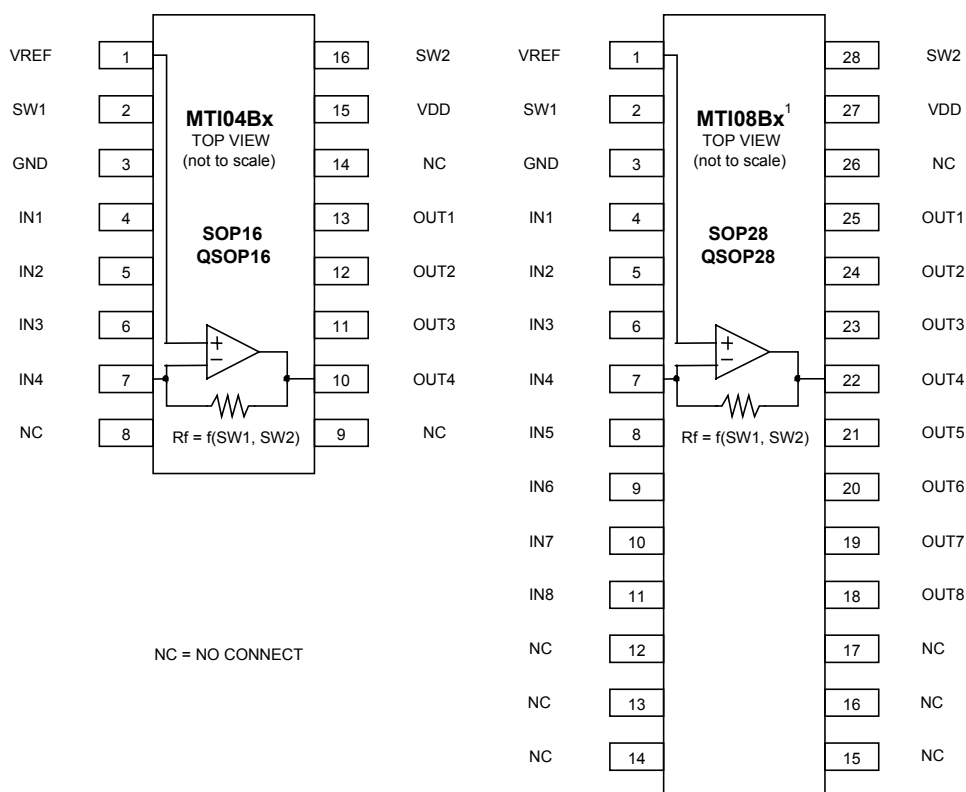
### 6.1 Shape and Dimensions



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°
MTI08BS <sup>1</sup>	SOP28L	17,90	7,49	10,31	2,54	0,20	1,27	0,41	0,76	4°
MTI08BQ <sup>1</sup>	QSOP28L	9,9	3,8	6,0	1,75	0,15	0,635	0,38	0,72	4°

### 6.2 Pin-Configuration



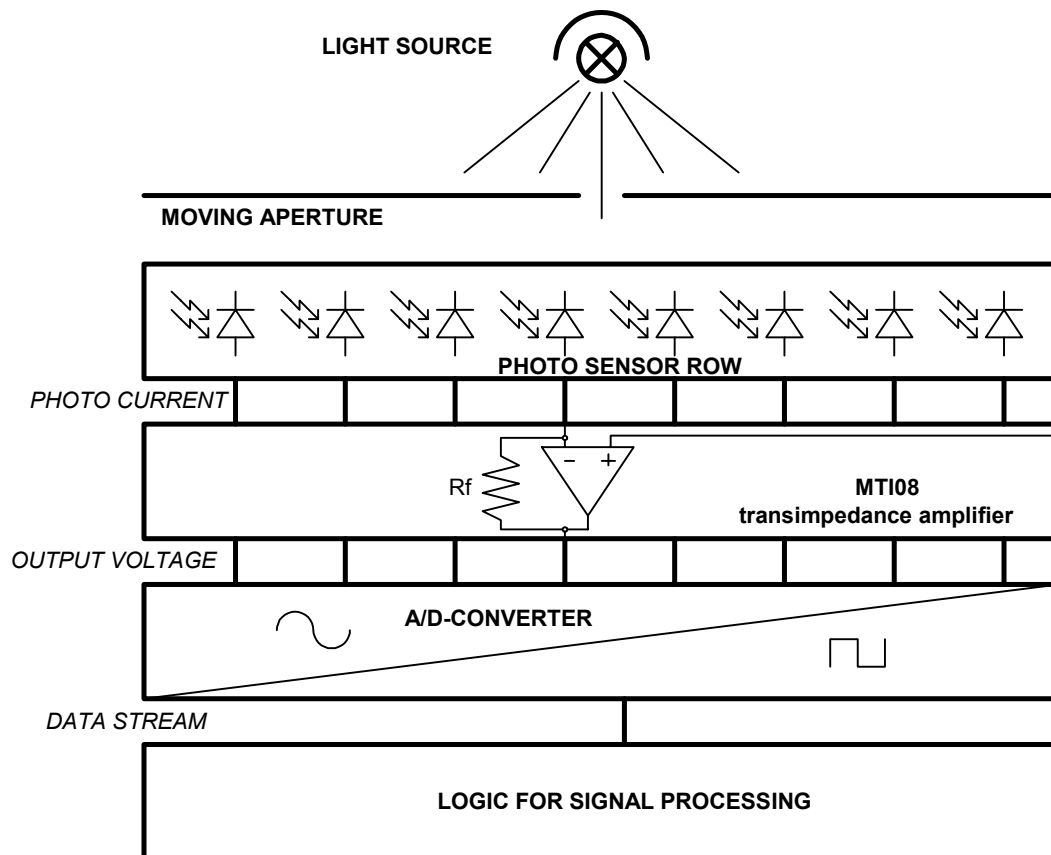
<sup>1</sup> Only customised available



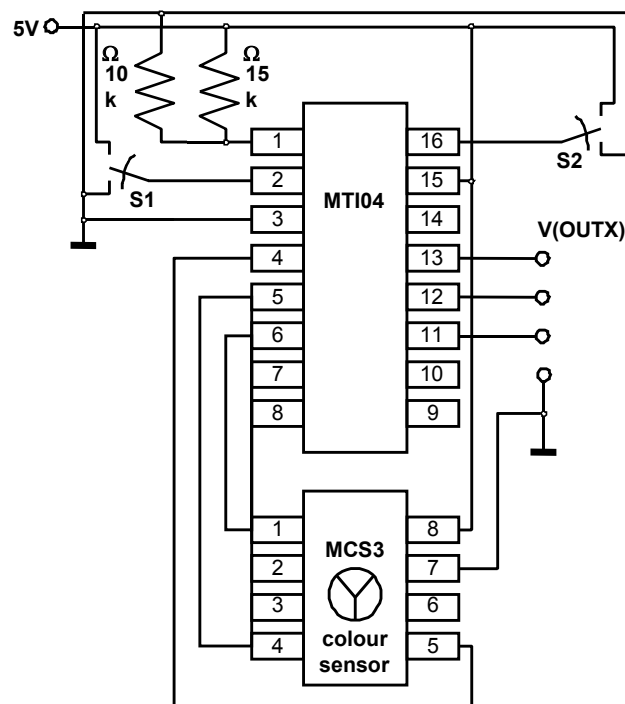
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## 7. APPLICATIONS

### 7.1 Example For Position Measurement



### 7.2 Connection Of A Colour Sensor



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## 8. ORDERING INFORMATION

NAME OF PRODUCT	PACKAGE	NUMBER OF CHANNELS
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MTI04BS	SOP16	4
MTI04BQ	QSOP16	4
MTI08BS <sup>2</sup>	SOP28	8
MTI08BQ <sup>2</sup>	QSOP28	8

## 9. CONTACT

For further information, please feel free to contact:

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<sup>2</sup> Only customised available