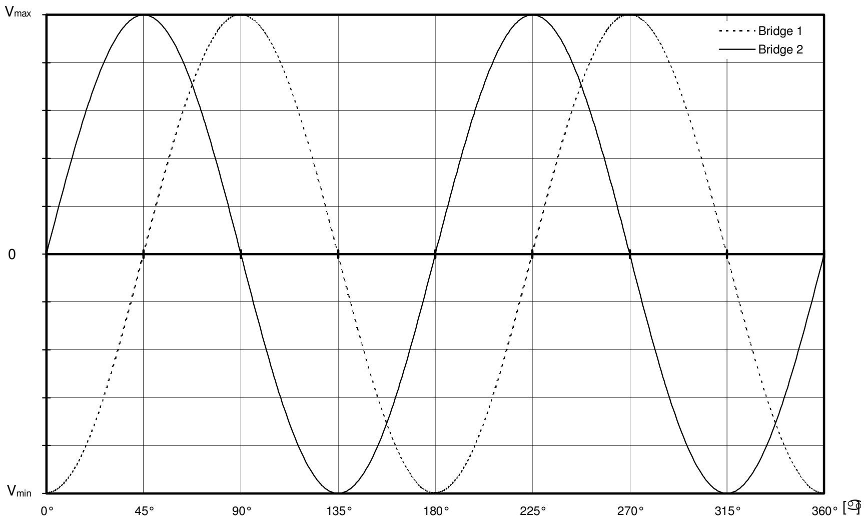
Function principle

Magnetoresistive materials can change their resistivity in an external magnetic field. The variation of the resistivity is determined by the rotation of magnetisation with respect to the direction of the current flow. Permalloy ($Ni_{81}Fe_{19}$) is commercially used as magnetoresistive material. The relative change of resistivity is 2-3 % for this material. The high sensitive and small size sensor consists of a silicon chip coated with thin film permalloy stripes. These stripes form a Wheatstone bridge whose output voltage depends on the magnetic field.

Characteristic

Magnetic fields vertical to the chip surface have no influence on the output voltage. A strong magnetic field $H_{rot} \geq 50$ kA/m parallel to the chip surface causes a sinusoidal output signal which is determined by the angle between field direction and orientation of the permalloy stripes of the Wheatstone bridge. The field H_{rot} is created by a permanent magnet which rotates over the sensor. The sensor output gives information about the direction of the magnet. The output characteristic of an additional galvanic seperated Wheatstone bridge is 45° phase shifted compared with the other bridge.



Output voltage of both Wheatstone bridges versus angle α of the magnetic field direction

Application

The KMT 31 allows the contactless counting of the revolutions of a rotating magnet which is mounted on the axis of a wheel. Zero output voltages of the Wheatstone bridges are used as trigger signals. The sense of rotation of the wheel is taken into account by comparing the signal outputs of both Wheatstone bridges which are proportional to $\sin2(\alpha)$ or $\sin2(\alpha + 45°)$. The angle can be determined by evaluating these signals. Alternatively it is possible to use the voltage signals of four half bridges which are trimmed on $V_b/2$.

HL-Planartechnik GmbH

Hauert 13, D - 44 227 Dortmund, Tel.: +49 (0) 231/97400, Fax.: +49 (0) 231/974020
Internet: http://www.hlplanar.com E-Mail: service@hlplanar.de

Technical data

Absolute maximum ratings			
Parameter	**Symbol**	**Unit**	**Value**
Supply voltage	V_B	V	5
Total power dissipation	P_{to}	mW	120
Operating temperature range	T_{amb}	°C	-40 ... + 125
Storage temperature range	T_{stg}	°C	-65 ... +125
Sensor chip alignment error	α_e	°	≤ 2

Electrical characteristics (T_{amb}= 25°C, H_{rot} $\geq$ 25 kA/m)				Condition	
Parameter	**Symbol**	**Unit**	**Value**	**bridge 2**	**bridge 1**
Bridge resistance	R_B	kOhm	3 ± 1.0		
Offset voltage	V_{OFF}/V_B	mV/V	$\leq \pm 2.0$	α=0°	α=45°
Half bridge symmetry	$(V_s/2 - V_o)/V_B$	mV/V	$\leq \pm 2.0$	α=0°	α=45°
Sensitivity	S_α	(mV/V)/°	> 0.418	α=0°	α=45°
Output voltage range	$(\lvert V_{max}\rvert + \lvert V_{min}\rvert)/V_B$	mV/V	≥ 24		
Zero offset angle hysteresis	$\Delta\alpha$	°	≤ 1		

Temperature coefficients (- 25 °C < T_{amb} < 125 °C) of bridge 1 and 2			
Parameter	**Symbol**	**Unit**	**Value**
Bridge resistance	T_{CBR}	%/K	0.30 ± 0.05
Open circuit sensitivity (V_B = const)	T_{CSV}	%/K	-0.30 ± 0.05
(I_B = const)	T_{CSI}	%/K	0.00 ± 0.05
Offset voltage	T_{COFF}	(µV/V)/K	$\leq \pm 3$

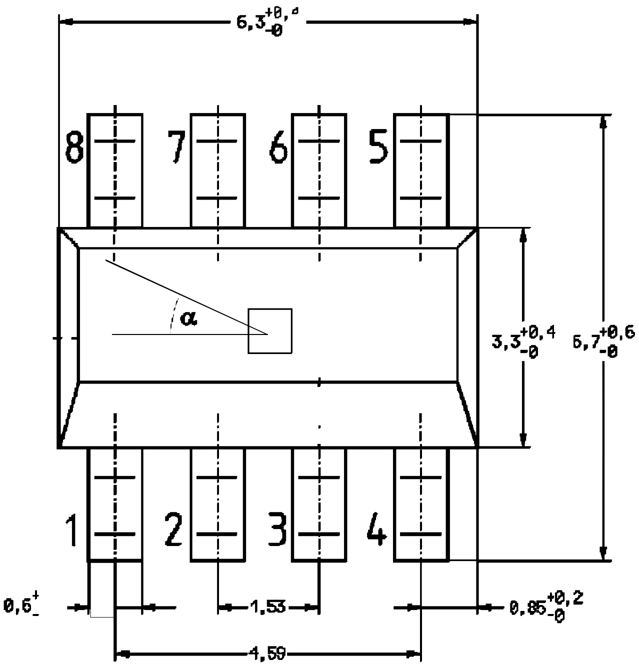
Housing of KMT31: SM-8

bridge 1:

pin 4: + V_B (GND)
pin 8: GND (+V_B)
pin 1: - V_0 (+ V_0)
pin 5: + V_0 (- V_0)

bridge 2:

pin 3: + V_B (GND)
pin 7: GND (+ V_B)
pin 2: - V_0 (+ V_0)
pin 6: + V_0 (- V_0)



Assembly is pining independent. Sensor mirror symmetrically built !

Sensors in thin film technology

HL-Planartechnik GmbH

Hauert 13, D - 44 227 Dortmund, Tel.: +49 (0) 231/97400, Fax.: +49 (0) 231/974020
Internet: http://www.hlplanar.com E-Mail: service@hlplanar.de