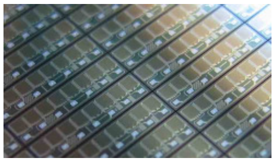
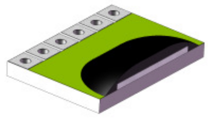
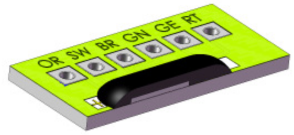
Magnetic Length Sensor MLS



Wafer



Small Hybride

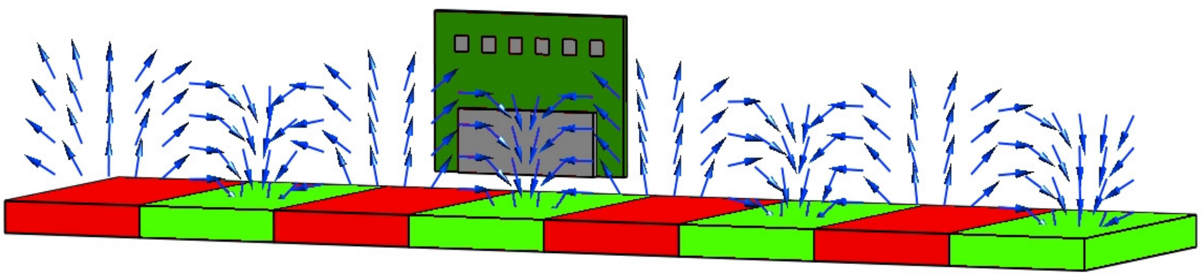


Large Hybride

- **AMR gradient sensor**
- **Linear displacement, movements, velocities**
- **High precision**
- **Various pole pitches available**

DESCRIPTION

Sliding the MLS-Sensors along a magnetic scale will produce a sine and a cosine output signal as a function of the position. In order to deliver satisfying results, this will be achieved as long as the air gap between sensor edge and magnetic scale surface does not exceed half of the pole pitch. As the sensor principle is based on the anisotropic magneto resistance effect, the signal amplitudes are nearly independent on the magnetic field strength and therefore air gap variations do not have a big effect on the accuracy. The sensor detects a magnetic gradient field and is thus almost insensitive to homogenous stray fields.



Precise displacement values will be archived by using a sine/cosine decoder. The maximal obtainable precision depends on the distance sensor – magnetic scale and on the accuracy of the magnetic scale. Values of <1% of the pole pitch are common.

FEATURES

- Sin- / cos-output signals suitable for signal evaluation by standard-ASIC's
- Very high precision
- Insensitive to air gap fluctuations
- Highly reliable
- Low interference field sensitivity

APPLICATIONS

- Linear displacement, movements, velocities in dirty environments
- Very precise angular measurement using pole wheels

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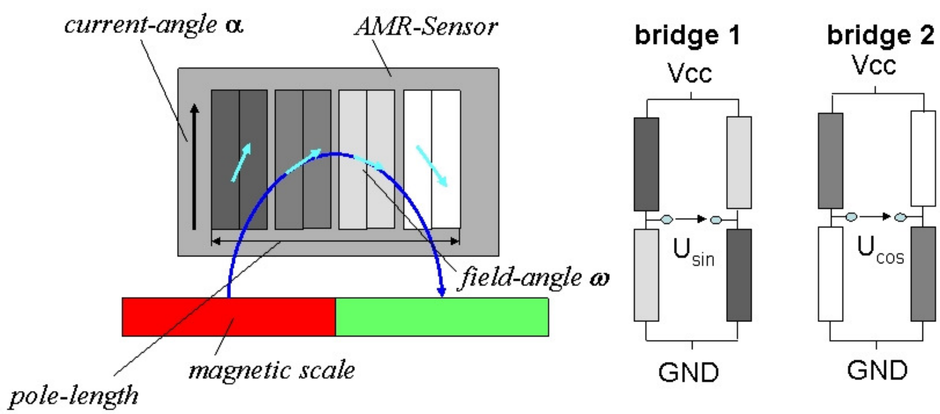
SENSOR BASICS

The MLS-sensors consists of two magneto resistive Wheatstone bridges, generating two phase-shifted signals by means of a lateral offset. MLS-sensors will only cooperate well together with pole stripes meeting their design-pole pitch.In addition, some sensor types integrate over more than one pole in order to improve sensor performance.



CHARACTERISTIC VALUES

PARAMETER	SYMBOL	CONDITION	TYPE	MIN	TYP	MAX	UNIT
1. Operating Limits							
max. supply voltage	$V_{cc,max}$					**10**	V
max. current (both bridges)	$I_{cc,max}$		MLS1000/8 MLS2000/5000			**5** **10**	mA
operating temperature	T_{op}			**-40**		**+85**	°C
storage temperature	T_{st}			**-40**		**+125**	°C
2. Sensor Specifications (T=25 °C)							
Supply voltage	V_{cc}				**5**		V
pole pitch *)	p		MLS1000 MLS2000 MLS5000 MLS8		**1000** **2000** **5000** **2500**		µm
Resistance (both bridges)	R_b		MLS1000 MLS2000/5000 MLS8	**2000** **1000** **30000**	**3000** **1500** **40000**	**4000** **2000** **50000**	Ω
Output signal range	$\Delta V_n/V_{cc}$	A, B		**16**	**20**		mV/V
Offset voltage	$V_{n\ off}$	A, B		**-1**	**0**	**+1**	mV/V
3. Sensor Specifications							
TC of amplitude	TCSV	A, C		**-0.36**	**-0.32**	**-0.28**	%/K
TC of resistance	TCBR	A, C		**+0.27**	**+0.32**	**+0.37**	%/K
TC of offset	TCVoff	A, C		**-4**	**0**	**+4**	µV/V/K

n = 1;2 (bridge number); Stress above one or more of the limiting values may cause permanent damage to the device. Exposure to limiting values for extended periods may affect device reliability.

*) other pole pitches on request

Magnetic Length Sensor MLS

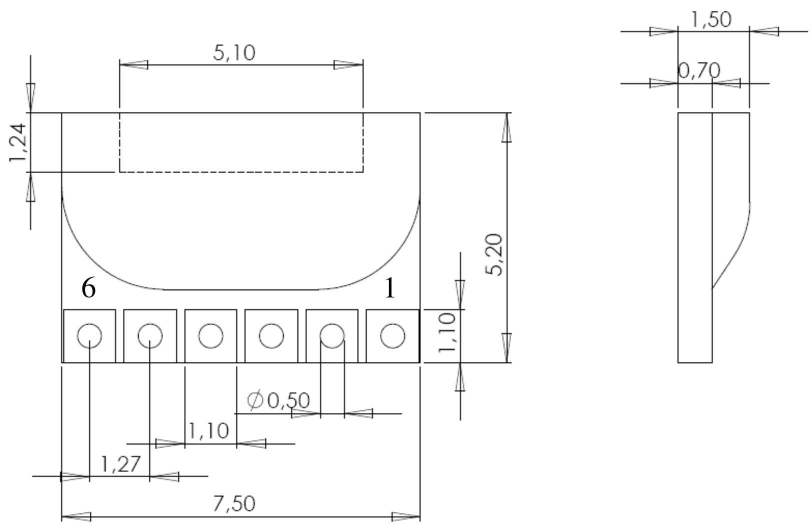
MEASUREMENT CONDITIONS

PARAMETER	SYMBOL	UNIT	CONDITION
A. Set Up Conditions			
ambient temperature	T	°C	T = 23±5 °C (unless otherwise noted)
supply voltage	V_{cc}	V	Vcc = 5 V
applied magnetic field	H	kA/m	H > 10 kA/m
B. Sensor Specifications (T=25 °C, 360° turn , H=25 kA/m , Vo_{max}>0, Vo_{min}<0)			
output signal range	$\Delta V_n / V_{cc}$	mV/V	$\Delta V_n / V_{cc} = (V_{n\ max} - V_{n\ min}) / V_{cc}$
signal offset	$V_{off\ n}$	mV/V	$V_{off\ n} = (V_{n\ max} + V_{n\ min}) / V_{cc}$
C. Sensor Specifications (T=-25°C, +125°C)			
ambient temperatures	T	°C	T_1 = -25 °C, T_0 = +25 °C, T_2 = +125 °C
TC of amplitude	*TCSV*	%/K	$TCV = \frac{1}{(T_2 - T_1)} \cdot \frac{\frac{\Delta V_n}{V_{cc}}(T_2) - \frac{\Delta V_n}{V_{cc}}(T_1)}{\frac{\Delta V_n}{V_{cc}}(T_1)} \cdot 100\%$
TC of resistance	*TCBR*	%/K	$TCR = \frac{1}{(T_2 - T_1)} \cdot \frac{R_n(T_2) - R_n(T_1)}{R_n(T_1)} \cdot 100\%$
TC of offset	*TCVoff*	µV/(VK)	$TCVoff_n = \frac{Voff_n(T_2) - Voff_n(T_1)}{(T_2 - T_1)}$

n = 1;2 (bridge number)

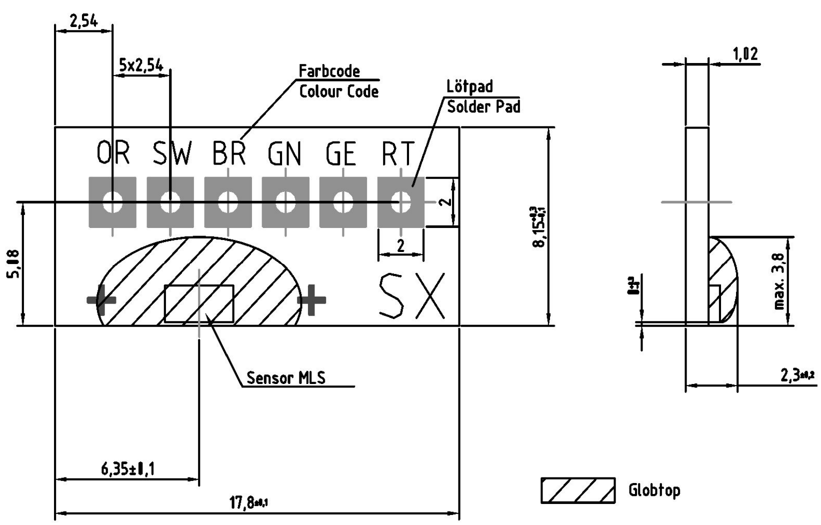
PACKAGES

HK (SMALL HYBRIDE)



Pin	Annotation	Name
1	Output signal	V_{cos-}
2	Supply voltage	V_{cc}
3	Ground	GND
4	Output signal	V_{sin-}
5	Output signal	V_{sin+}
6	Output signal	V_{cos+}

HS (STANDARD HYBRIDE)



Pin	Annotation	Name
OR	Output signal	V_{cos-}
SW	Supply voltage	V_{cc}
BR	Ground	GND
GN	Output signal	V_{sin-}
GE	Output signal	V_{sin+}
RT	Output signal	V_{cos+}

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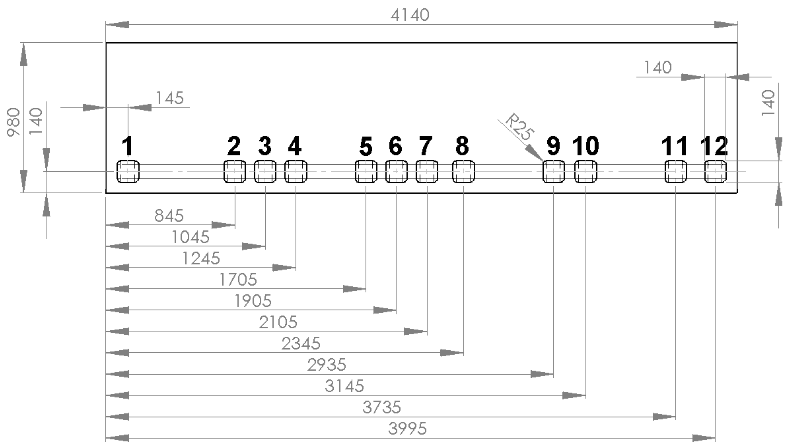
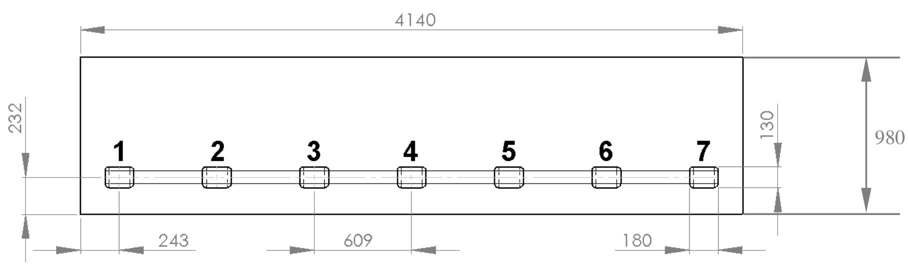
DIE GEOMETRIES

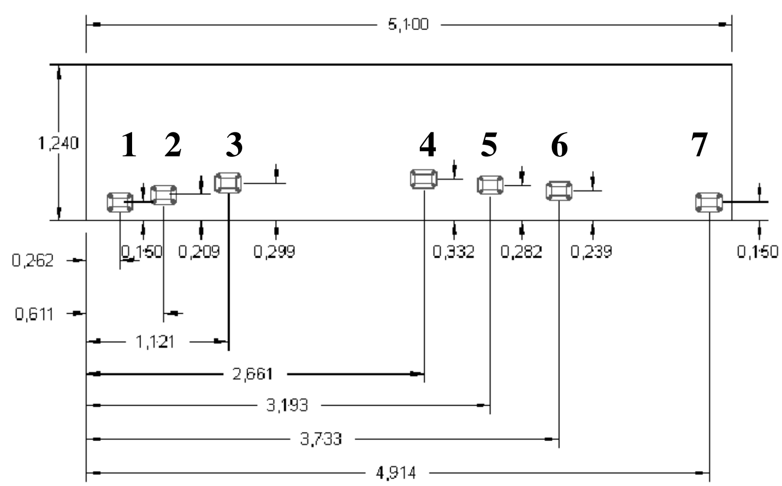
MLS 1000 (DIE)



MLS 2000 (DIE)



MLS 5000/8 (DIE)



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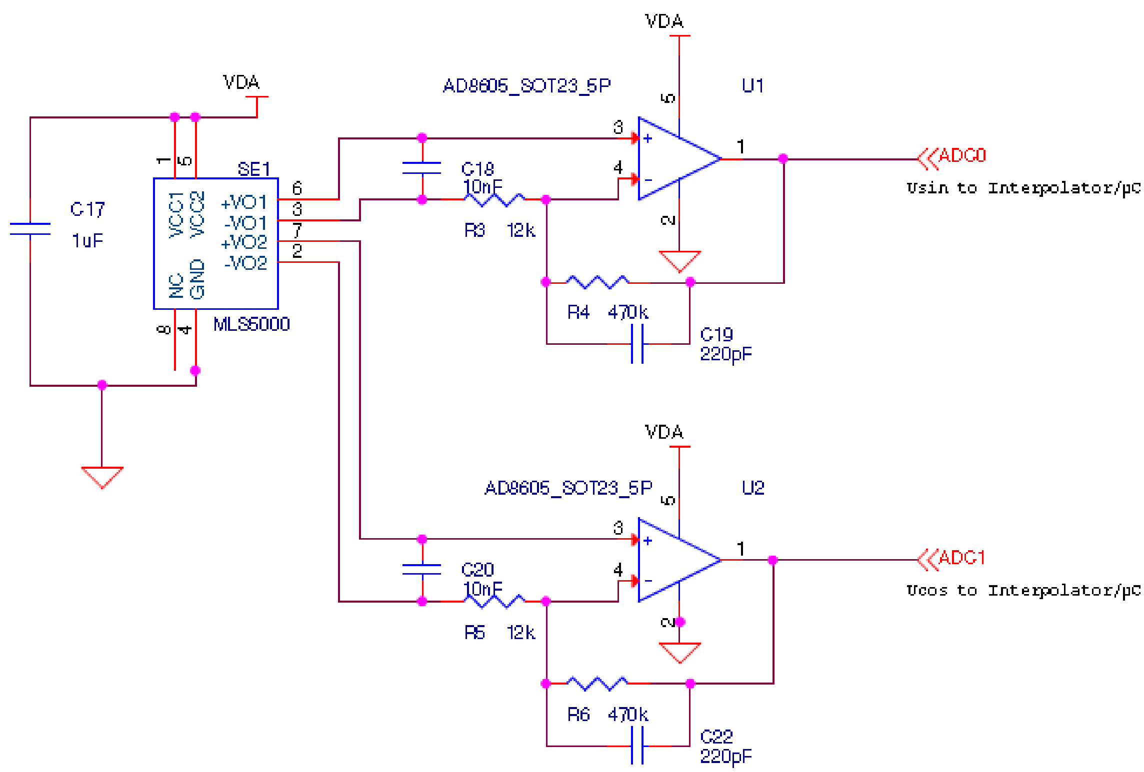
PIN ASSIGNMENT (DIES)

Pin	MLS1000	MLS2000	MLS5000	MLS8
1	Vcc	-V2	Vcc (bridge 2)	+V1
2	-V1	-V1	-V2	+V2
3	+V1	-V2	-V1	GND
4	-V1	GND	GND	Vcc
5	-V2	Vcc	Vcc (bridge 1)	-V1
6	+V2	+V1	+V1	-V2
7	-V2	+V2	+V2	-
8	R1	-	-	-
9	R1	-	-	-
10	R2	-	-	-
11	R2	-	-	-
12	GND	-	-	-

APPLICATION EXAMPLE



Exemplary hardware configuration using an Analog Devices AD8605 amplifier for preprocessing MLS5000 signals for usage with common Microcontroller.

Magnetic Length Sensor MLS

ORDERING CODES

	MLS1000	MLS2000	MLS5000	MLS8
Wafer (diced) *)	**G-MRCH-018**	*on request*	**G-MRCH-017**	*on request*
Wafer (undiced) *)	**G-MRCH-019**	*on request*	**G-MRCH-007**	*on request*
Large hybride (HS)	*on request*	*eng. samples*	**G-MRCO-012**	*eng. samples*
Small hybride (HK)	*on request*	*eng. samples*	**G-MRCO-013**	*eng. samples*

*) MOQ is one wafer

ORDERING INFORMATION

Measurement Specialties, Inc. 1000 Lucas Way Hampton, VA 23666 Tel: 1-800-555-1551 Fax: 1-757-766-4297 Email: sales@meas-spec.com Web: www.meas-spec.com	Europe MEAS Deutschland GmbH Hauert 13, D-44227 Dortmund, Germany. Phone: +49-(0)231-9740-0 Fax: +49-(0)231-9740-20 Email: info.de@meas-spec.com Web: www.meas-spec.com	Measurement Specialties China Ltd. No. 26, Langshan Road, Shenzhen High-tech Park (North) Nanshan District, Shenzhen, China 518107 Phone: +86-755-33305088 Fax: +86-755-33305099 Email: info.cn@meas-spec.com Web: www.meas-spec.com