MLS (HYBRID)

Linear Position Sensor

HD (Small two sided Hybrid)

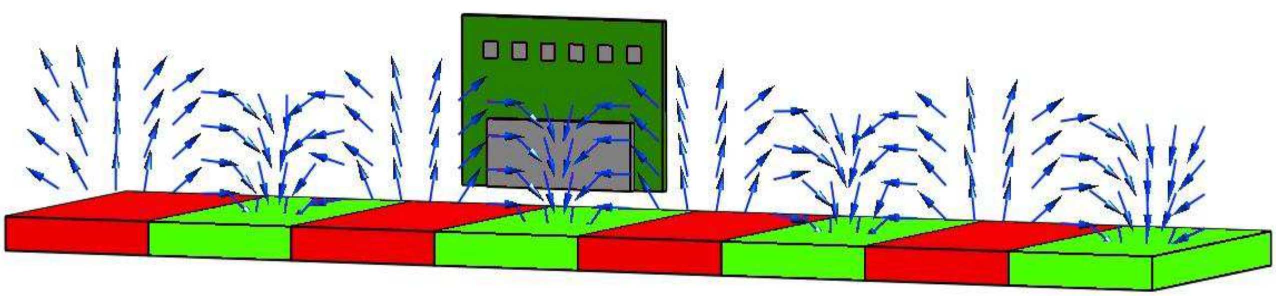
Large Hybride

SPECIFICATIONS

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

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 approximately 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 strong effect on the accuracy. The sensor detects a magnetic gradient field and is thus almost insensitive to homogenous magnetic stray fields.

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



FEATURES

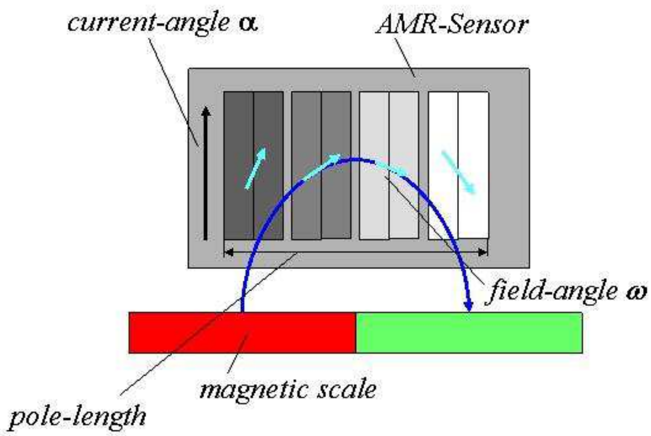
- Sin- / cos-output signals suitable for signal evaluation by standard-ASIC's
- Very high precision
- Insensitive to air gap fluctuations
- Highly reliable
- Low interference field sensitivity

APPLICATIONS

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

SENSOR BASICS

The MLS-sensors consists of two magneto resistive Wheatstone bridges, whose resistors are placed in a way that in combination with a magnetic scale, a sine and a cosine signal is obtained. Thus, MLS sensors will only work together well with pole stripes that meet the 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**	**22**		mV/V

Offset voltage	$V_{n\ off}$	A, B		**-1**	**0**	**+1**	mV/V
3. Sensor Specifications							
TC of amplitude	TCSV	A, C			**-0.35**		%/K
TC of resistance	TCBR	A, C			**+0.35**		%/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

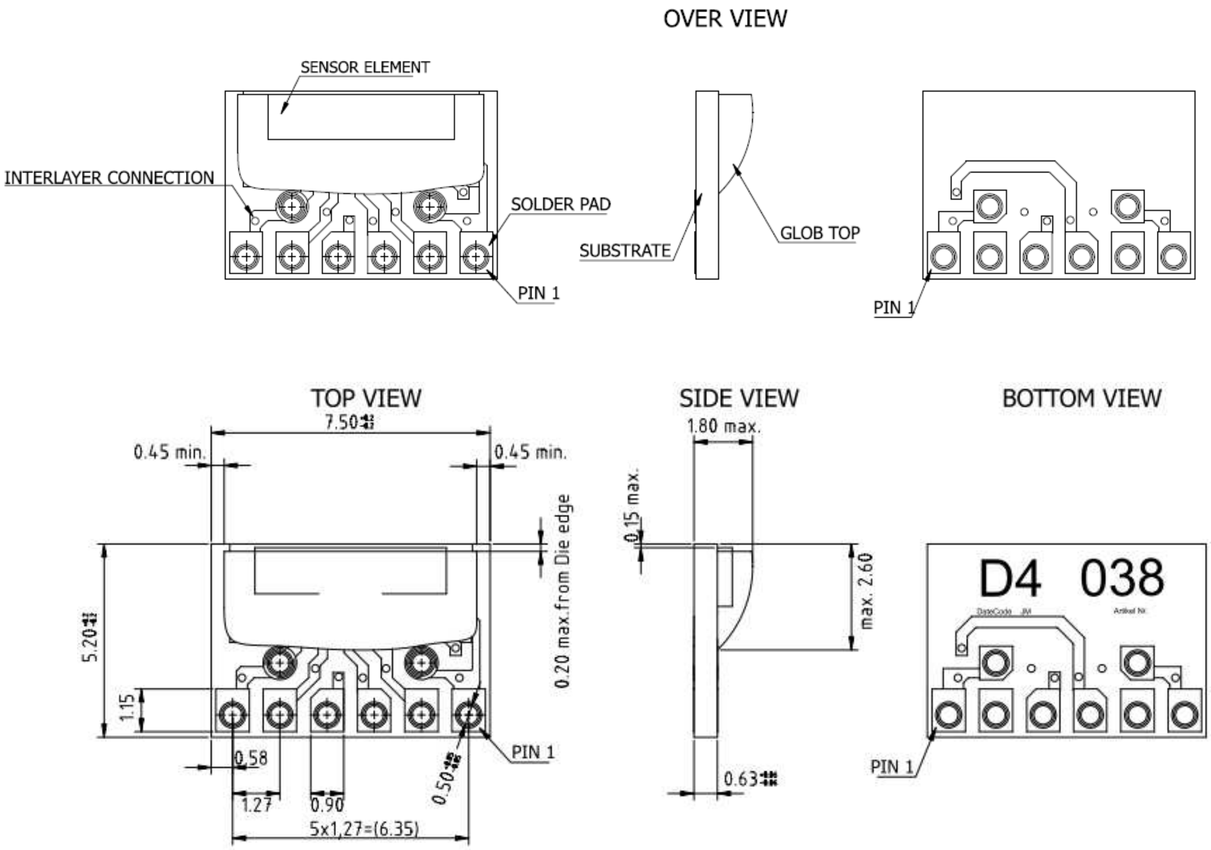
MEASUREMENT CONDITIONS

PARAMETER	SYMBOL	UNIT	CONDITION
A. Set Up Conditions			
ambient temperature	T	°C	T = 25 °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)

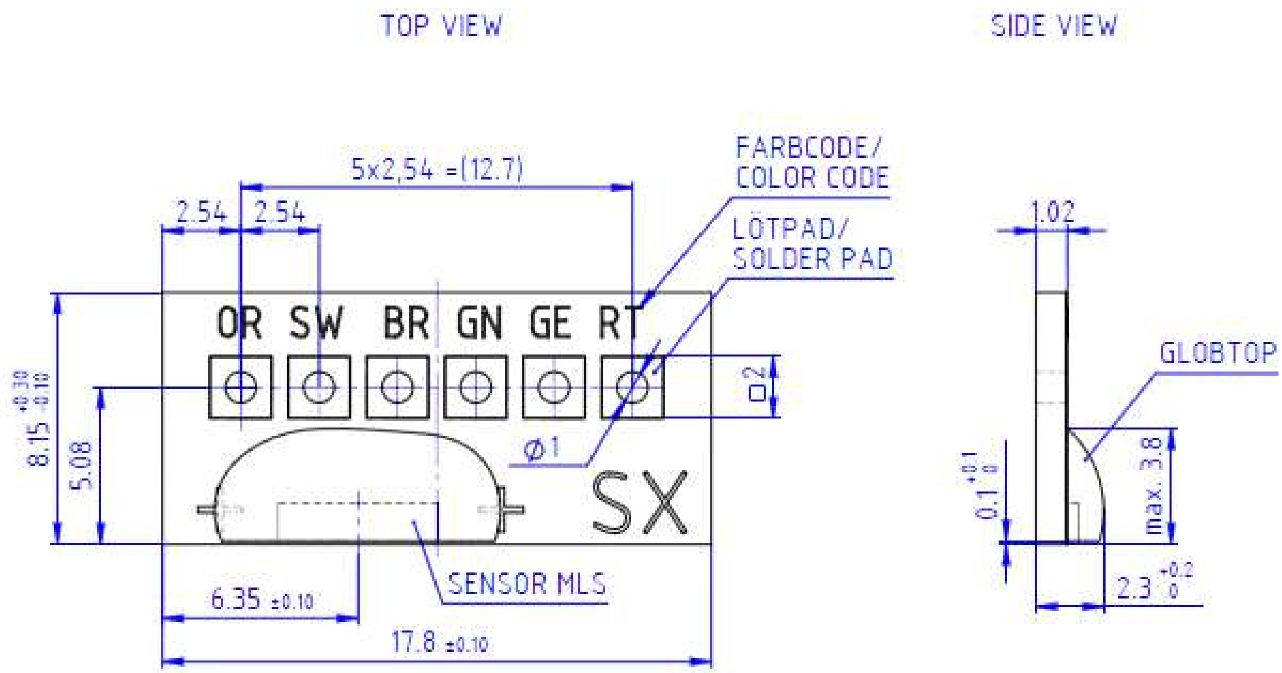
PACKAGES

HD (SMALL TWO SIDED HYBRID)

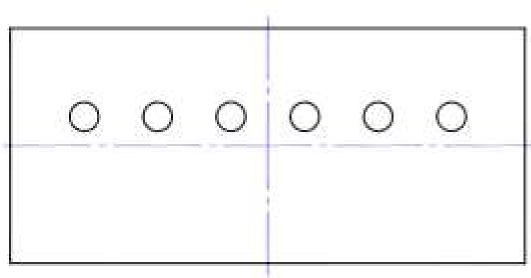


Pin	MLS1000HD	MLS2000HD	MLS5000HD	MLS8HD
1	GND	+V2	+V2	+V2
2	Vcc	Vcc	Vcc	Vcc
3	-V2	GND	GND	GND
4	+V2	+V1	+V1	+V1
5	-V1	-V1	-V1	-V2
6	+V1	-V2	-V2	-V1

HS (STANDARD HYBRID)

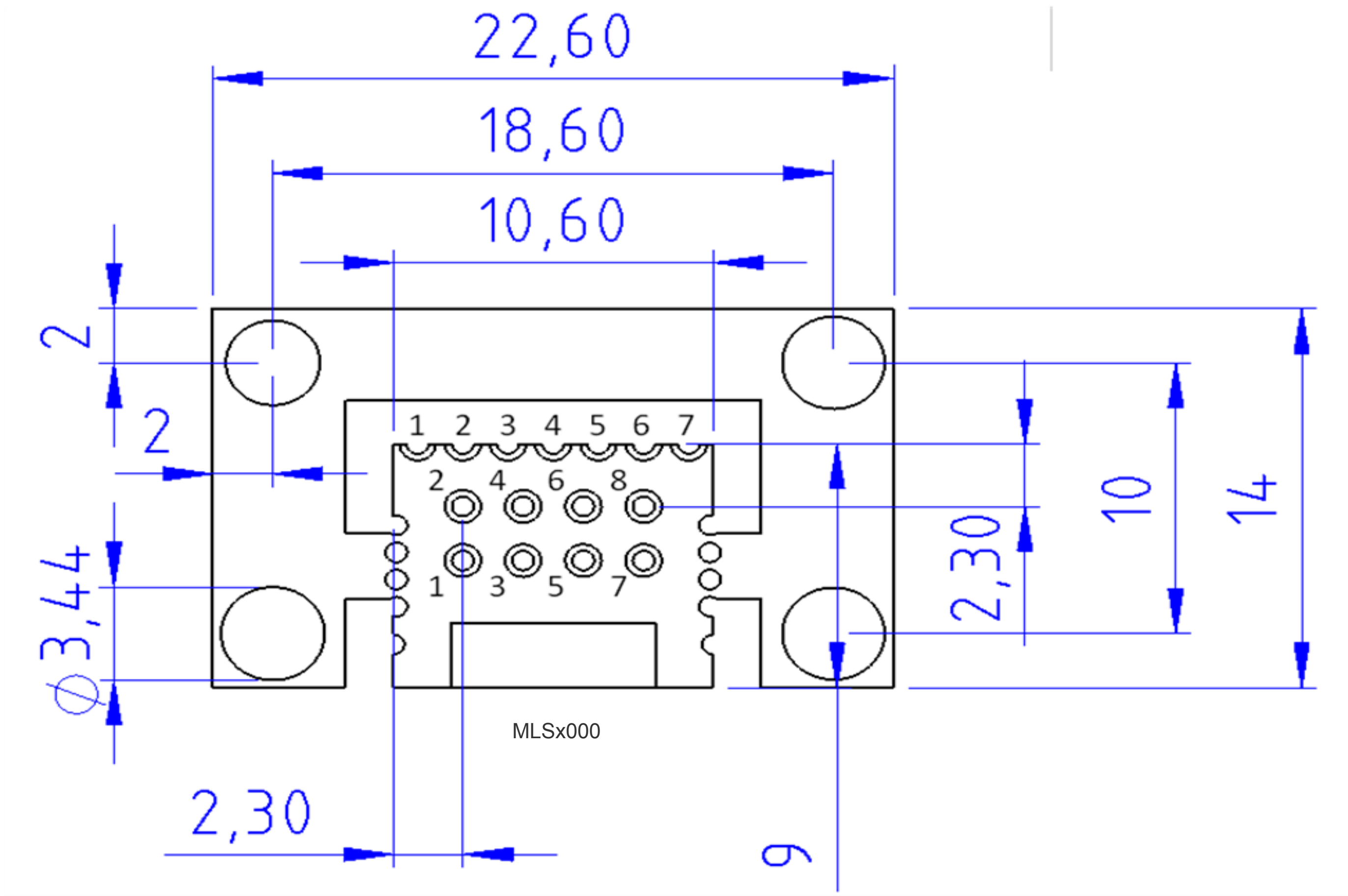


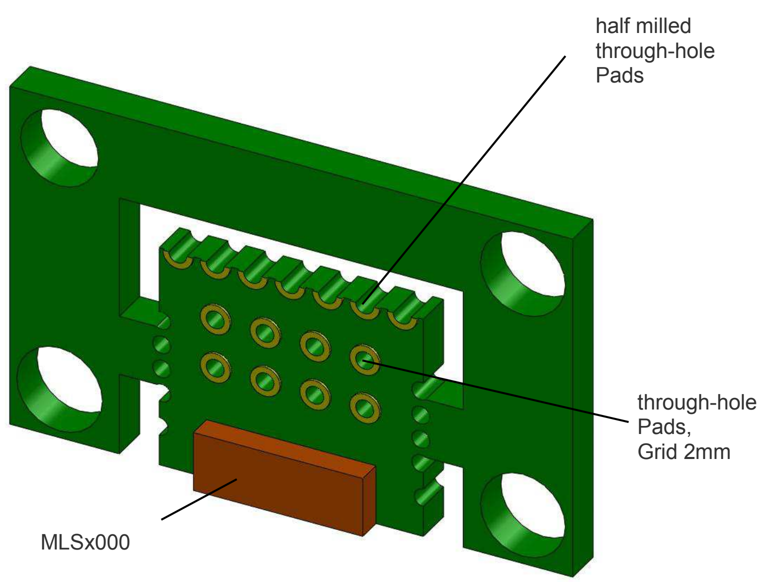
BOTTOM VIEW



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+}

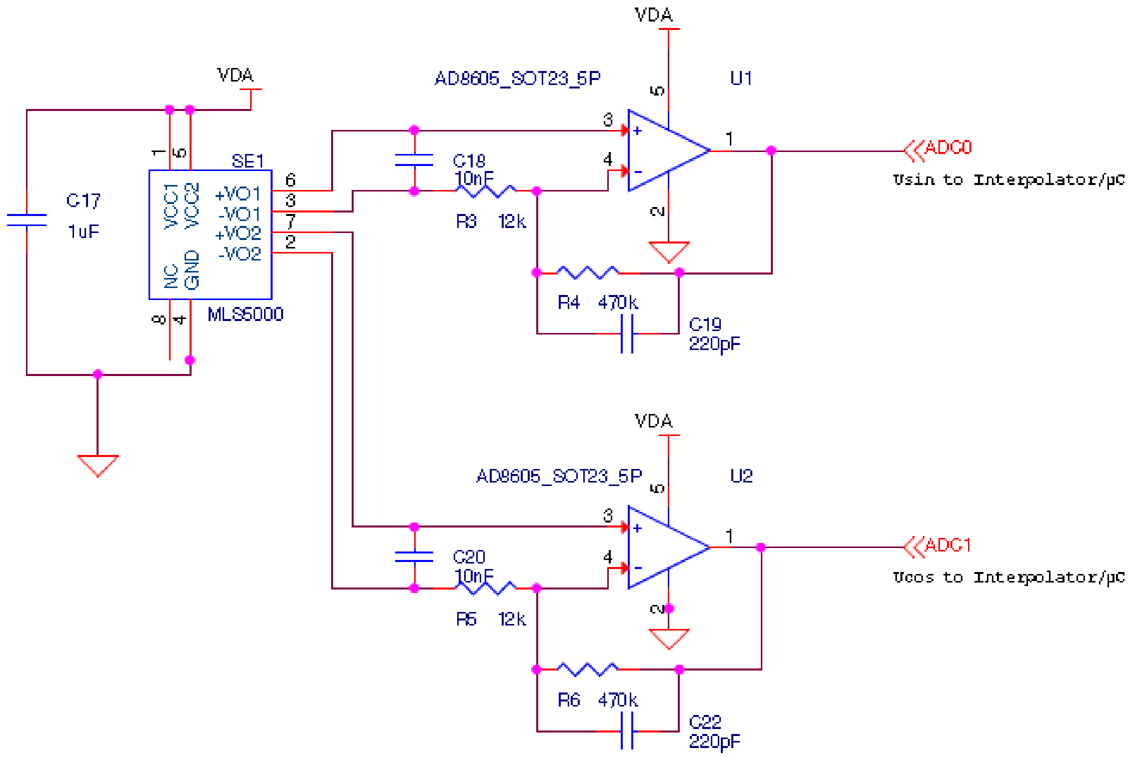
EVALUATION KIT





Pin	Annotation	Name
1	Ground	Gnd
2	Output signal	V_{cos+}
3	Output signal	V_{sin+}
4	Supply voltage	V_{cc2}
5	Output signal	V_{sin-}
6	Output signal	V_{cos-}
7	Supply voltage	V_{cc1}

APPLICATION EXAMPLE



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

TEST REQUIREMENTS

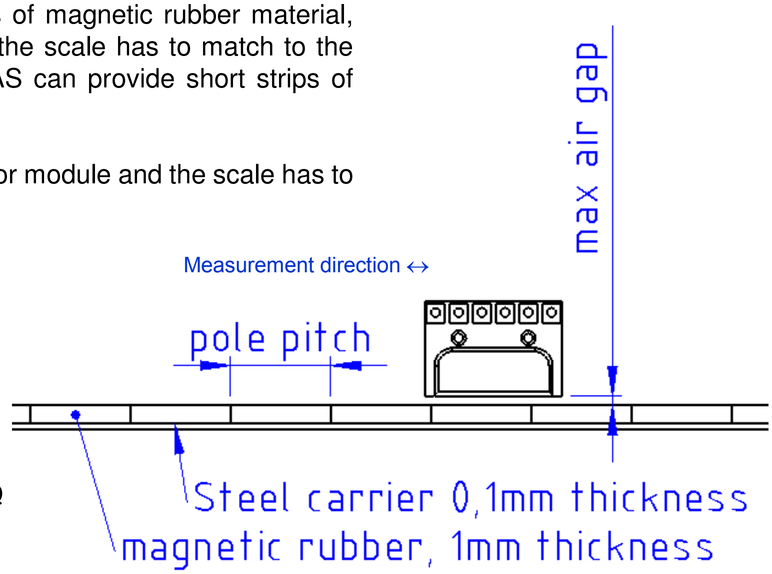
The parameters of the MLS sensor are measured in combination with a magnetic scale. The magnetic scale consists of magnetic rubber material, bonded on a steel carrier. The pole pitch of the scale has to match to the sensor type (see characteristic values). MEAS can provide short strips of scales for reference.

The maximum used air gap between the sensor module and the scale has to match the sensor type and not exceed:

MLS1000:	0.5 mm
MLS2000:	1 mm
MLS5000:	2.5 mm
MLS8:	1.25 mm

Test temperature: 25°C

The use of IC-Haus interpolation circuit IC-NQ is recommended for signal evaluation.



ORDERING CODES

	MLS1000	MLS2000	MLS5000	MLS8
Large hybrid (HS)	*on request*	*eng. samples*	**G-MRCO-012**	*eng. samples*
2side hybrid (HD)	**G-MRCO-038**	**G-MRCO-039**	**G-MRCO-040**	**G-MRCO-041**

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