## iC-SM5L

### LINEAR AMR SENSOR (5 mm)



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#### **FEATURES**

- ♦ Magneto resistive position sensor based on the AMR effect
- ♦ Strong field sensor for 5 mm N/S pole pitch
- ♦ High interpolation due to a sine signal with few harmonics
- ♦ Low saturation field strength
- ♦ High amplitude consistency with changes in distance
- ♦ Resistant to strong magnetic fields
- ♦ Not sensitive to external homogenous magnetic fields
- ♦ Small SMT capable package

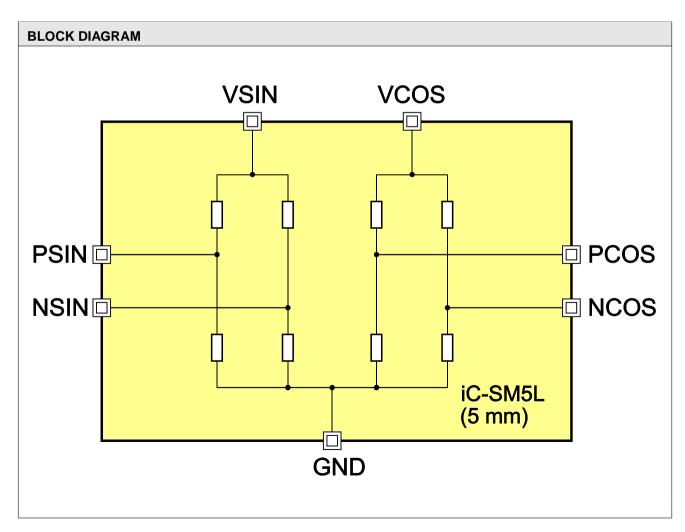
#### **APPLICATIONS**

- ♦ Linear position sensing
- ♦ Length measuring systems
- ♦ Off-axis hollow shaft rotary encoders

#### **PACKAGES**



LGA SM2C 7.6 mm x 2.8 mm x 1.8 mm RoHS compliant



## iC-SM5L

### LINEAR AMR SENSOR (5 mm)



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#### **DESCRIPTION**

iC-SM5L is a linear position sensor which operates on the AMR effect (anisotropic magneto resistance) and has been designed to work with magnetic scales which have a N/S pole pitch of 5 mm.

When the Sensor is moved along a magnetic scale with a N/S pole pitch of 5 mm the two Wheatstone bridges generate differential sinusoidal output voltages (PSIN - NSIN) and (PCOS - NCOS) phase-shifted at 90°. One sine/cosine cycle averaged using a pair of N/S poles is thus produced for a pole

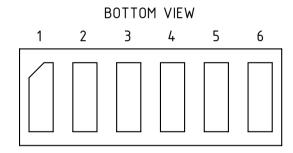
width. The absolute magnetic field strength must be large enough for the sensor to go into saturation and for the magnetization of iC-SM5L's resistor stripes to assume the direction of the outer magnetic fields.

The amplitudes of the differential output voltages are largely independent of the magnetic field strength and thus not sensitive to changes in distance.

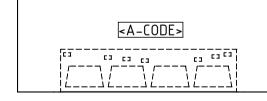
iC-SM5L is resistant to strong magnetic fields and not sensitive to external homogenous magnetic fields.

#### **PACKAGING INFORMATION**

#### **PIN CONFIGURATION**







#### **PIN FUNCTIONS**

#### No. Name Function

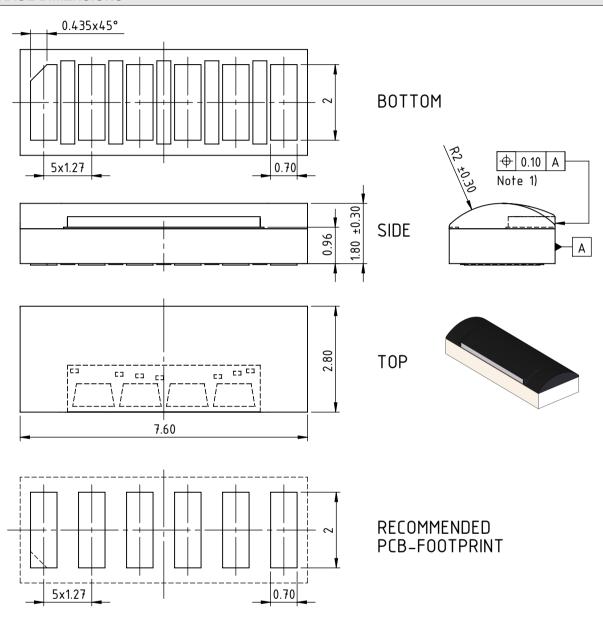
- 1 PCOS Noninverted Cosine Output
- 2 NCOS Inverted Cosine Output
- 3 VCC Supply Voltage
- 4 GND Ground
- 5 PSIN Noninverted Sine Output
- 6 NSIN Inverted Sine Output

IC top marking: <A-CODE> = assembly code (subject to changes).



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#### **PACKAGE DIMENSIONS**



#### Note 1):

- Caution: Do not touch exposed sensor edge.
- Sensor edge can be set back or overhang by up to 0.05 mm vs. substrate egde.

All dimensions given in mm. General tolerances according to ISO-2768-mK Position tolerance of sensor pattern:  $\pm 0.20$  mm /  $\pm 1$  ° (with respect to backside pads).

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#### **ABSOLUTE MAXIMUM RATINGS**

These ratings do not imply operating conditions; functional operation is not guaranteed. Beyond these ratings device damage may occur.

Item	Symbol	Parameter	Conditions			Unit
No.				Min.	Max.	
G001	V()	Voltage at VB		-10	10	V
G002	V()	Voltage at PSIN, NSIN, PCOS, NCOS		-10	10	V
G003	I()	Current in VB		-10	10	mA
G004	I()	Current in PSIN, NSIN, PCOS, NCOS		-10	10	mA
G005	Tj	Junction Temperature		-40	125	°C
G006	Ts	Chip Storage Temperature		-40	125	°C

#### THERMAL DATA

Operating conditions:  $VB = 5V \pm 10\%$ 

Item	Symbol	Parameter	Conditions				Unit
No.				Min.	Тур.	Max.	
T01	Та	Operating Ambient Temperature Range	package LGA SM2C (extended temperature range of -40 to 125 °C available on request)	-20		90	°C
T02	Ts	Storage Temperature Range	package LGA SM2C	-30		110	°C
T03	TI	Soldering Peak Temperature	package LGA SM2C				
			$t_{pk}$ < 20 s, convection reflow $t_{pk}$ < 20 s, vapour phase			260 230	°C
			TOL (time on label) 8 h; please refer to customer information file No. 7 for details				



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#### **ELECTRICAL CHARACTERISTICS**

**Operating Conditions:** 

 $VB = 5 V \pm 10 \%$ ,  $VCOS = 5 V \pm 10 \%$ , Tj = -40...125 °C, |Hext| > 25 kA/m at the bottom edge of the sensor, unless otherwise noted

Item	Symbol	Parameter	Conditions				Unit
No.				Min.	Тур.	Max.	
Total	Device						
001	VB	Permissible Supply Voltage VSIN, VCOS	VB = VSIN = VCOS	-10		10	V
002	I(VB)	Supply Current in VSIN, VCOS	PSIN, NSIN, PCOS, NCOS open VSIN connected to VCOS	5		10	mA
003	R()	Sensor Resistance of one (sine and cosine bridge)	VSIN connected to VCOS, Tj = 25 °C	1	1.5	2	kΩ
004	TC(R)	Bridge Resistance Temperature Coefficient		0.29	0.33	0.37	%/K
005	Vpk	Amplitude of Differential Output Voltages		8		20	mV/V
006	TC(Vpk)	Amplitude Temperature Coefficient		-0.37	-0.33	-0.29	%/K
007	Vos	Diff. Output Offset Voltage	Hext = 0 kA/m at the bottom edge of the sensor	-3		3	mV/V
008	TC(Vos)	Offset Voltage Temperature Coefficient		-3		3	μV/V/K
009	Vrel	Relative Change in Amplitude	distance bottom edge of the sensor to the magnetic scale: 0 2.5 mm	-5		5	%
010	AAabs	Absolute Angle Accuracy	without offset voltage, distance bottom edge of the sensor to the magnetic scale: 1 mm	-1		1	DEG

#### **APPLICATION INFORMATION**

iC-SM5L is placed vertically above a magnetic scale with an equal distribution of N/S pole pairs.

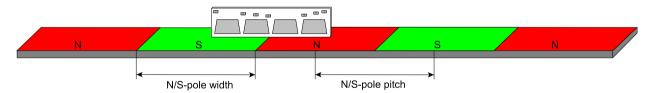


Figure 1: Placement of the iC-SM5L to a magnetic scale



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#### **APPLICATION INFORMATION: Handling**



Figure 2: Handling instruction: NOT OK.

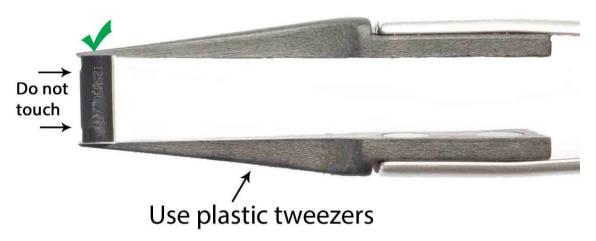


Figure 3: Handling instruction: OK.

#### **REVISION HISTORY**

Re	Rel.Date	Chapter	Modification	Page
B1	14-07-04		Datasheet replaces former iC-SM5L datasheet release A3 and package datasheet LGA SM2C release A2.	all

Rel	Rel.Date	Chapter	Modification	Page
B2	14-10-14		All package Figures updated	1 - 3

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#### **ORDERING INFORMATION**

Туре	Package	Options	Order Designation
iC-SM5L	6-pin LGA SM2C, 7.6 mm x 2.8 mm, thickness 1.8 mm RoHS compliant		iC-SM5L LGA SM2C

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