

iC-SM5L

LINEAR AMR SENSOR (5 mm)



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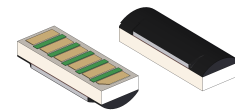
FEATURES

- ◆ 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

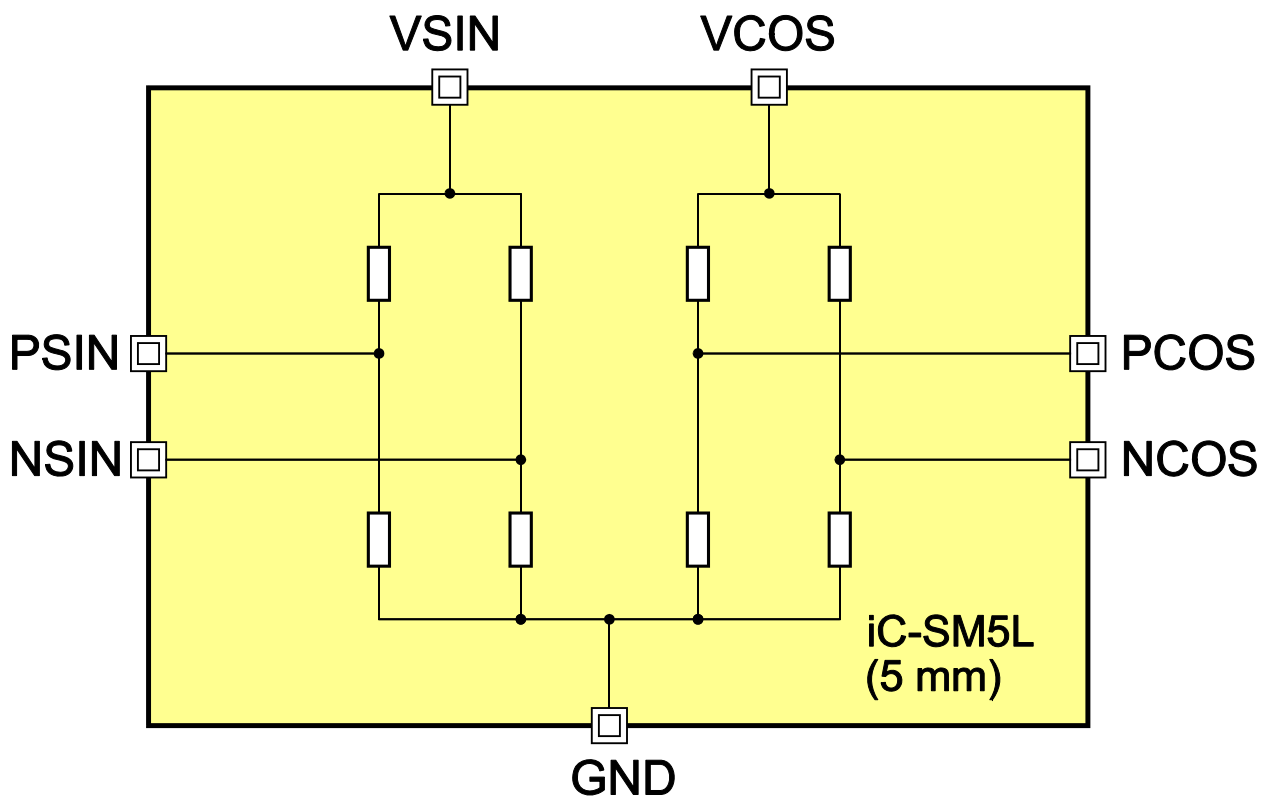
- ◆ Linear position sensing
- ◆ Length measuring systems
- ◆ Off-axis hollow shaft rotary encoders

PACKAGES



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

BLOCK DIAGRAM



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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

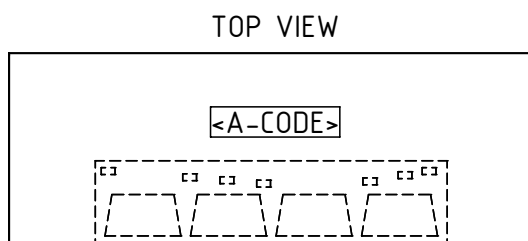
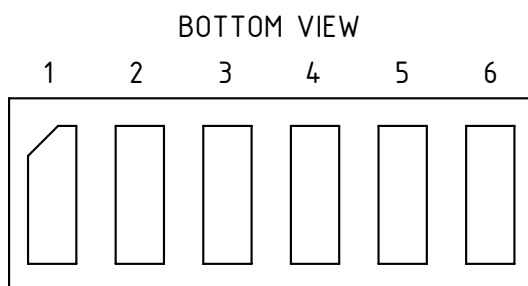
width. The absolute magnetic field strength must be large enough for the sensor to go into saturation and for the magnetization of iC-SM5L's resistor stripes to assume the direction of the outer magnetic fields.

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

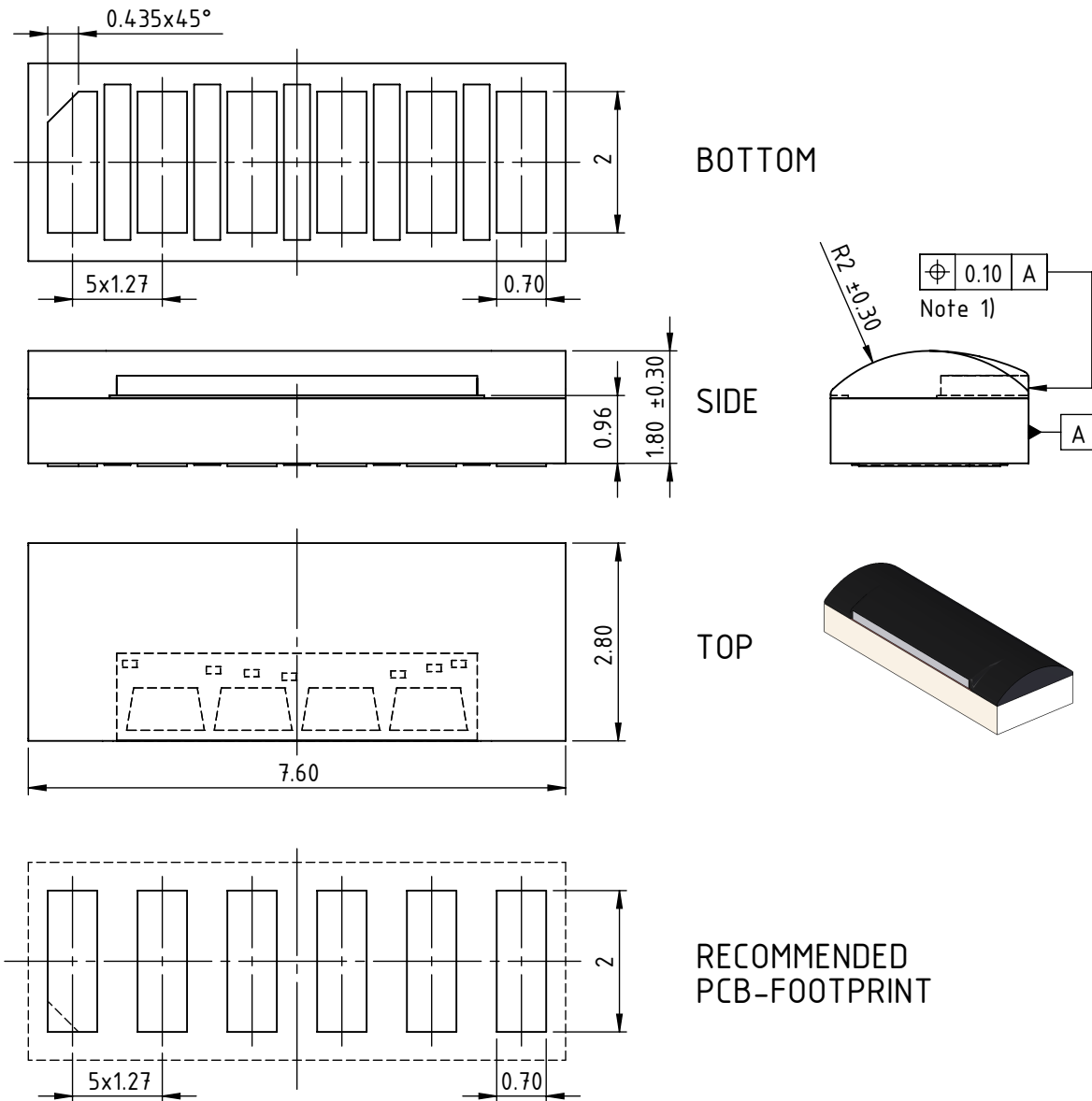
No.	Name	Function
1	PCOS	Noninverted Cosine Output
2	NCOS	Inverted Cosine Output
3	VCC	Supply Voltage
4	GND	Ground
5	PSIN	Noninverted Sine Output
6	NSIN	Inverted Sine Output

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 edge.

All dimensions given in mm. General tolerances according to ISO-2768-mK
 Position tolerance of sensor pattern: ± 0.20 mm / $\pm 1^\circ$ (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 No.	Symbol	Parameter	Conditions			Unit
				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 ±10 %

Item No.	Symbol	Parameter	Conditions				Unit
				Min.	Typ.	Max.	
T01	Ta	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	Tl	Soldering Peak Temperature	package LGA SM2C $t_{pk} < 20$ s, convection reflow $t_{pk} < 20$ s, vapour phase TOL (time on label) 8 h; please refer to customer information file No. 7 for details			260 230	°C °C

All voltages are referenced to ground unless otherwise stated.

All currents flowing into the device pins are positive; all currents flowing out of the device pins are negative.

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ELECTRICAL CHARACTERISTICS

Operating Conditions:

$V_B = 5V \pm 10\%$, $V_{COS} = 5V \pm 10\%$, $T_j = -40 \dots 125^\circ C$, $|H_{ext}| > 25 \text{ kA/m}$ at the bottom edge of the sensor, unless otherwise noted

Item No.	Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
Total Device							
001	V_B	Permissible Supply Voltage V_{SIN} , V_{COS}	$V_B = V_{SIN} = V_{COS}$	-10		10	V
002	$I(V_B)$	Supply Current in V_{SIN} , V_{COS}	P_{SIN} , N_{SIN} , P_{COS} , N_{COS} open V_{SIN} connected to V_{COS}	5		10	mA
003	$R()$	Sensor Resistance of one (sine and cosine bridge)	V_{SIN} connected to V_{COS} , $T_j = 25^\circ C$	1	1.5	2	$k\Omega$
004	$TC(R)$	Bridge Resistance Temperature Coefficient		0.29	0.33	0.37	%/K
005	V_{pk}	Amplitude of Differential Output Voltages		8		20	mV/V
006	$TC(V_{pk})$	Amplitude Temperature Coefficient		-0.37	-0.33	-0.29	%/K
007	V_{os}	Diff. Output Offset Voltage	$H_{ext} = 0 \text{ kA/m}$ at the bottom edge of the sensor	-3		3	mV/V
008	$TC(V_{os})$	Offset Voltage Temperature Coefficient		-3		3	$\mu V/V/K$
009	V_{rel}	Relative Change in Amplitude	distance bottom edge of the sensor to the magnetic scale: 0 ... 2.5 mm	-5		5	%
010	AA_{abs}	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.

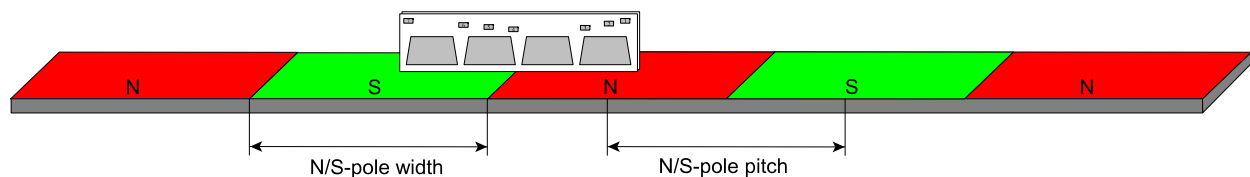


Figure 1: Placement of the iC-SM5L to a magnetic scale

APPLICATION INFORMATION: Handling



Figure 2: Handling instruction: **NOT OK.**

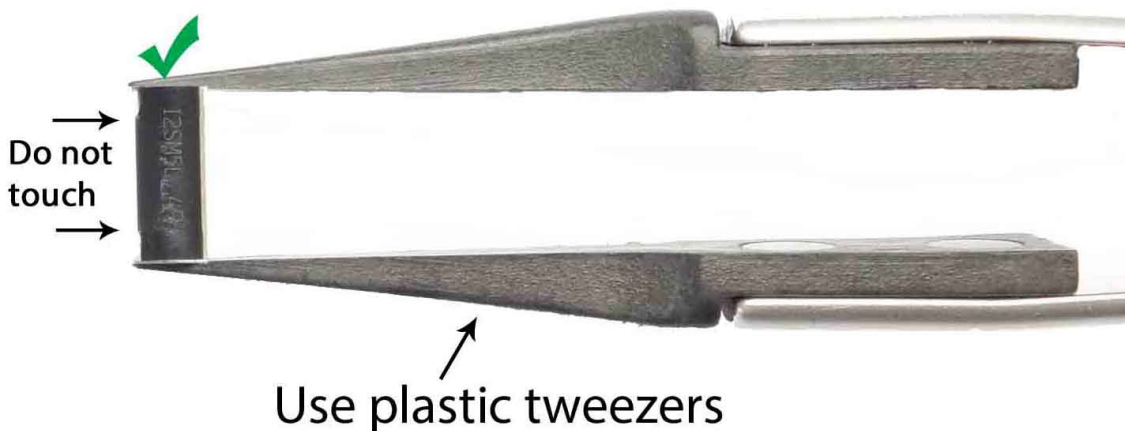


Figure 3: Handling instruction: **OK.**

REVISION HISTORY

Rel	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

Type	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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