DATA SHEET

KM110BH/2130; KM110BH/2190
Angle sensor hybrid

Preliminary specification
Supersedes data of November 1994
File under Discrete Semiconductors, SC17

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DESCRIPTION

Sensor module for contactless measurement of angular displacements of strong magnetic fields. The module is a ready-trimmed (sensitivity and zero point) combination of the magnetoresistive sensor KMZ10B and a signal conditioning circuit in hybrid technology. The KM110BH/2130 delivers a linear output signal that is proportional to the direction of the magnetic field. The KM110BH/2190 delivers a sinusoidal signal.

For new design-ins the KM110BH/23 and KM110BH/24 modules are recommended.

PINNING

PIN	DESCRIPTION
1	ground
2	V_{CC}
3	V_O

PIN CONFIGURATION

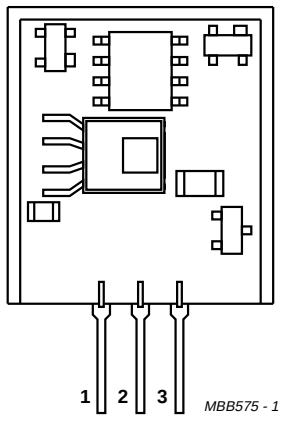


Fig.1 Simplified outline.

QUICK REFERENCE DATA

SYMBOL	PARAMETER	MIN.	TYP.	MAX.	UNIT
V_{CC}	DC supply voltage	–	5	–	V
V_O	output voltage range	0.5	–	4.5	V
α	angle range				
	KM110BH/2130	–15	–	+15	deg
	KM110BH/2190	–45	–	+45	deg
T_{op}	operating temperature	–40	–	+125	°C

LIMITING VALUES

In accordance with the Absolute Maximum Rating System (IEC 134).

SYMBOL	PARAMETER	MIN.	MAX.	UNIT
V_{CC}	supply voltage	4.5	5.5	V
I_{CC}	supply current	–	20	mA
T_{stg}	storage temperature	–40	+125	°C
T_{op}	operating temperature	–40	+125	°C
	output short-circuit duration	permanent (see note 1)		

Note

1. If pin 3 is shorted to either pin 1 or pin 2, current may flow permanently, without damage to the device.

CHARACTERISTICS

T_{amb} = 25 °C; V_{CC} = 5 V and a homogeneous magnetic field H_{ext} = 100 kA/m in the sensitive layer of the KMZ sensor; unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
α	angle range (note 1)					
	KM110BH/2130		–15	–	+15	deg
	KM110BH/2190	note 2	–45	–	+45	deg
V_O	output voltage range					
	KM110BH/2130	linear; see Fig.4	0.5	–	4.5	V
	KM110BH/2190	sinusoidal; see Fig.5	0.5	–	4.5	V
V_{zero}	zero point voltage	α = 0 deg	–	2.5	–	V
V_{off}	zero point offset voltage					
	KM110BH/2130		–45	–	+45	mV
	KM110BH/2190		–	±35	–	mV
S	sensitivity (note 3)	α = 0 deg				
	KM110BH/2130		–	139	–	mV/deg
	KM110BH/2190		–	70	–	mV/deg
FL	deviation of linearity (note 4)					
	KM110BH/2130		–	–	±1	%/FS
	KM110BH/2190		–	–	–	%/FS
SP_{max}	maximum angular speed					
	KM110BH/2130		–	10	–	deg/ms
	KM110BH/2190		–	30	–	deg/ms
R_L	load resistance		10	–	–	kΩ
Temperature coefficients (–40 to +85 °C)						
TCV_{zero}	temperature coefficient of zero point voltage					
	KM110BH/2130		–	0.6	–	mV/K
	KM110BH/2190		–	0.3	–	mV/K
TCS	temperature coefficient of sensitivity		–	±200	–	ppm/K

Notes

1. Refer to Fig.3. The magnetic field can be produced by using the first magnet listed in Table 1. Other magnets, along with their required distances from the front of the KMZ sensor, are also given.
2. Valid for $H_{ext} = \infty$. The real field strength of 100 kA/m gives a slightly higher operating angle range of ±46.5 deg.
3. The sensitivity will change slightly with +0.33% per 10% magnetic field increase if H_{ext} deviates from 100 kA/m.
4. Deviation from best straight line in angle range.

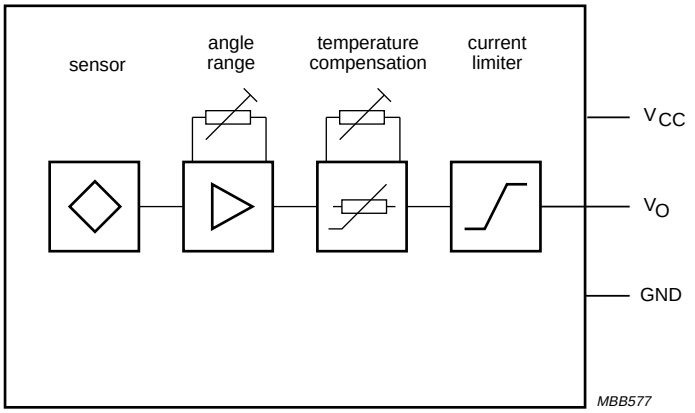


Fig.2 Circuit diagram.

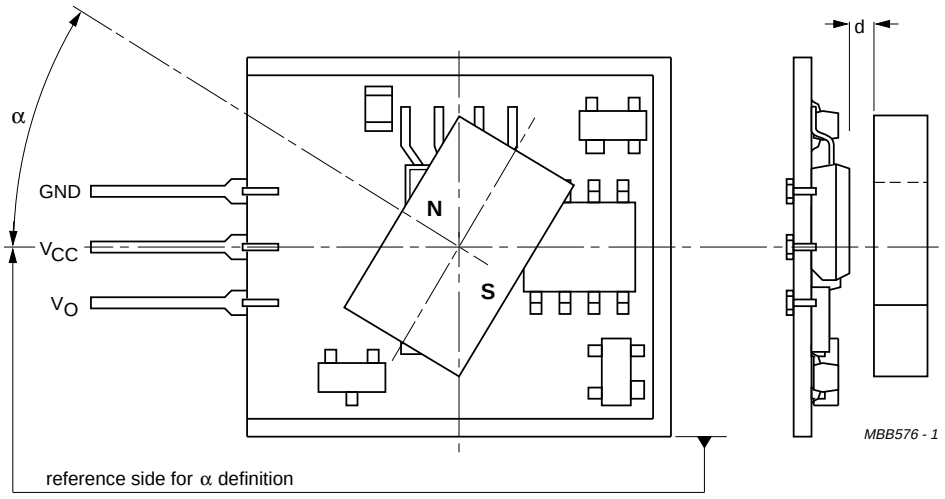


Fig.3 Optimum magnet position relative to the sensor module.

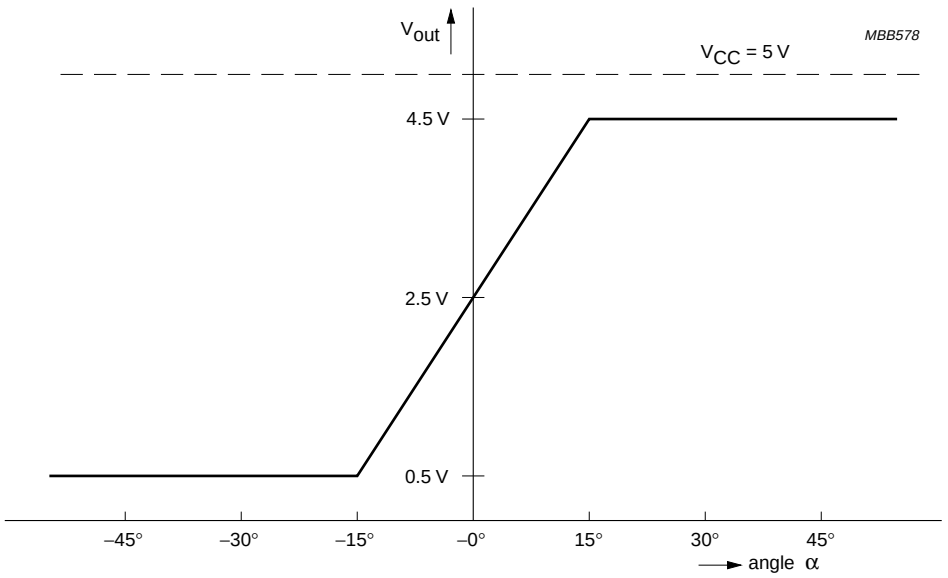


Fig.4 Output signal of KM110BH/2130.

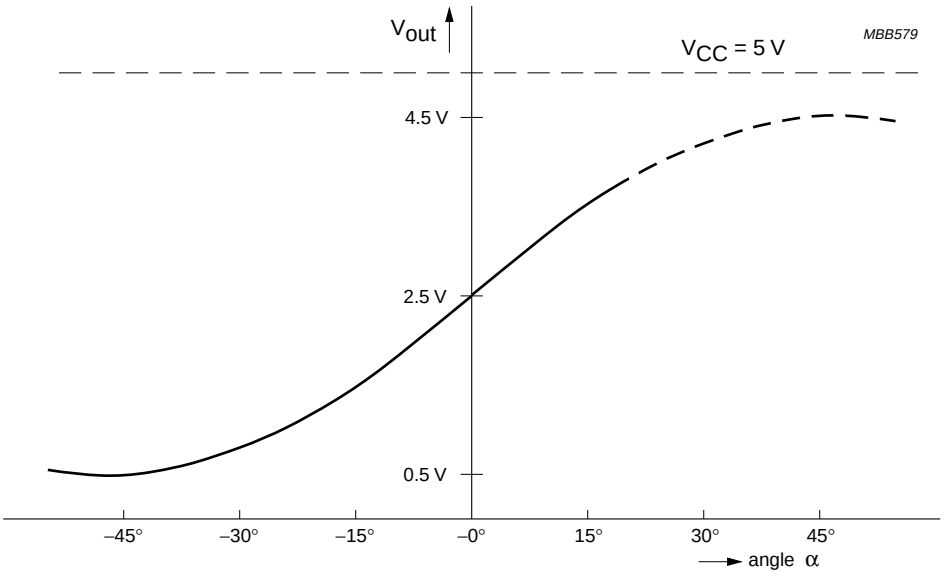


Fig.5 Output signal of KM110BH/2190.

Table 1 Magnets for angle sensor hybrids

MAGNETS			HYBRID ANGLE SENSORS			
MATERIAL	**DIMENSIONS(1) (mm)**	**TEMP. RANGE (°C)**	**DISTANCE d(2) (mm)**	**ANGLE RANGE CORRESPONDING TO V_O = 0.5 to 4.5 V**		**TEMP. RANGE (°C)**
				/2130	**/2190**	
NdFeB (note 3)	11.2 × 5.5 × 8	–55 to +110	2.5	30	93	–40 to +125
NdFeB (note 3)	6 × 3 × 5		0.8			
SmCo	11.2 × 5.5 × 8	–55 to +125	2.0	30	93	
SmCo	6 × 3 × 5		0.6			
FXD 330	10 × 7 × 8	–55 to +125	0.5	30.5	94.5	
FXD 330	7 × 5 × 4		0.2	30	93	

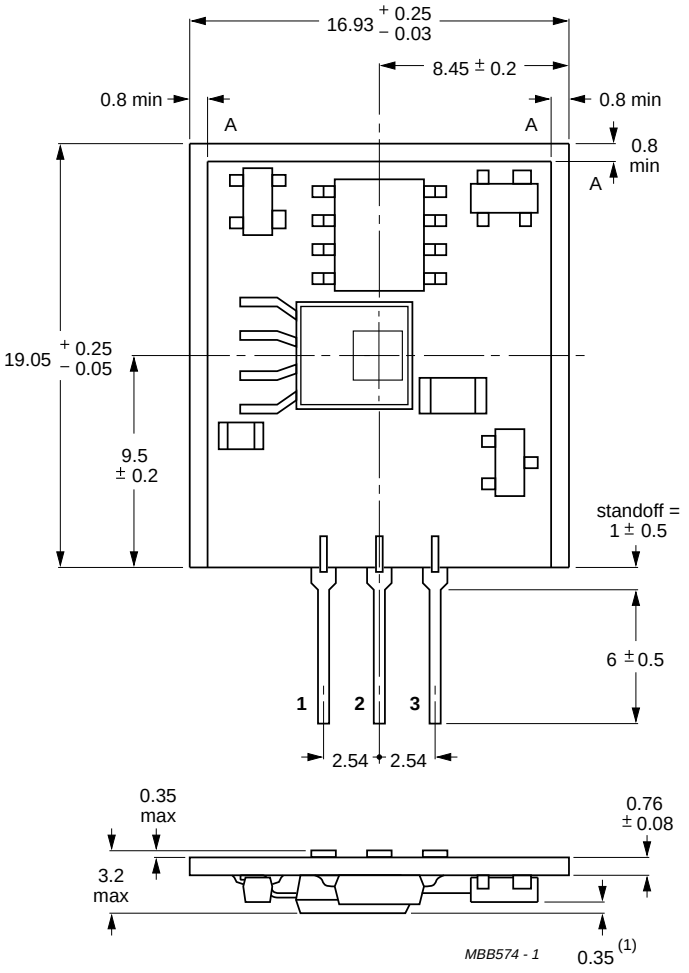
Notes

1. The magnetization is always parallel to the last dimension given for each magnet type.
2. Between magnet and KMZ sensor front as shown in Fig.3.
3. Special care must be taken to avoid exposure of NdFeB magnets to moisture or vapour.

APPLICATION

In life-support systems, the behaviour of electronic components throughout their working life can be unpredictable. The use of these devices in support systems can only be permitted when there is no danger to life caused by devices failing unexpectedly.

PACKAGE OUTLINE



Dimensions in mm.

Area 'A' free of SMD devices.

(1) Sensitive layer below KMZ front.

Fig.6 KM110BH/2130; KM110BH/2190.

DEFINITIONS

Data sheet status	
Objective specification	This data sheet contains target or goal specifications for product development.
Preliminary specification	This data sheet contains preliminary data; supplementary data may be published later.
Product specification	This data sheet contains final product specifications.
Limiting values	
Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 134). Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or at any other conditions above those given in the Characteristics sections of the specification is not implied. Exposure to limiting values for extended periods may affect device reliability.	
Application information	
Where application information is given, it is advisory and does not form part of the specification.	

LIFE SUPPORT APPLICATIONS

These products are not designed for use in life support appliances, devices, or systems where malfunction of these products can reasonably be expected to result in personal injury. Philips customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify Philips for any damages resulting from such improper use or sale.

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Philips Semiconductors – a worldwide company

Argentina: see South America

Australia: 34 Waterloo Road, NORTH RYDE, NSW 2113,
Tel. +61 2 9805 4455, Fax. +61 2 9805 4466

Austria: Computerstr. 6, A-1101 WIEN, P.O. Box 213,
Tel. +43 1 60 101, Fax. +43 1 60 101 1210

Belarus: Hotel Minsk Business Center, Bld. 3, r. 1211, Volodarski Str. 6,
220050 MINSK, Tel. +375 172 200 733, Fax. +375 172 200 773

Belgium: see The Netherlands

Brazil: see South America

Bulgaria: Philips Bulgaria Ltd., Energoproject, 15th floor,
51 James Bourchier Blvd., 1407 SOFIA,
Tel. +359 2 689 211, Fax. +359 2 689 102

Canada: PHILIPS SEMICONDUCTORS/COMPONENTS,
Tel. +1 800 234 7381

China/Hong Kong: 501 Hong Kong Industrial Technology Centre,
72 Tat Chee Avenue, Kowloon Tong, HONG KONG,
Tel. +852 2319 7888, Fax. +852 2319 7700

Colombia: see South America

Czech Republic: see Austria

Denmark: Prags Boulevard 80, PB 1919, DK-2300 COPENHAGEN S,
Tel. +45 32 88 2636, Fax. +45 31 57 1949

Finland: Sinikalliontie 3, FIN-02630 ESPOO,
Tel. +358 9 615800, Fax. +358 9 61580/xxx

France: 4 Rue du Port-aux-Vins, BP317, 92156 SURESNES Cedex,
Tel. +33 1 40 99 6161, Fax. +33 1 40 99 6427

Germany: Hammerbrookstraße 69, D-20097 HAMBURG,
Tel. +49 40 23 53 60, Fax. +49 40 23 536 300

Greece: No. 15, 25th March Street, GR 17778 TAVROS/ATHENS,
Tel. +30 1 4894 339/239, Fax. +30 1 4814 240

Hungary: see Austria

India: Philips INDIA Ltd, Shivsagar Estate, A Block, Dr. Annie Besant Rd.
Worli, MUMBAI 400 018, Tel. +91 22 4938 541, Fax. +91 22 4938 722

Indonesia: see Singapore

Ireland: Newstead, Clonskeagh, DUBLIN 14,
Tel. +353 1 7640 000, Fax. +353 1 7640 200

Israel: RAPAC Electronics, 7 Kehilat Saloniki St, TEL AVIV 61180,
Tel. +972 3 645 0444, Fax. +972 3 649 1007

Italy: PHILIPS SEMICONDUCTORS, Piazza IV Novembre 3,
20124 MILANO, Tel. +39 2 6752 2531, Fax. +39 2 6752 2557

Japan: Philips Bldg 13-37, Kohnan 2-chome, Minato-ku, TOKYO 108,
Tel. +81 3 3740 5130, Fax. +81 3 3740 5077

Korea: Philips House, 260-199 Itaewon-dong, Yongsan-ku, SEOUL,
Tel. +82 2 709 1412, Fax. +82 2 709 1415

Malaysia: No. 76 Jalan Universiti, 46200 PETALING JAYA, SELANGOR,
Tel. +60 3 750 5214, Fax. +60 3 757 4880

Mexico: 5900 Gateway East, Suite 200, EL PASO, TEXAS 79905,
Tel. +9-5 800 234 7381

Middle East: see Italy

Netherlands: Postbus 90050, 5600 PB EINDHOVEN, Bldg. VB,
Tel. +31 40 27 82785, Fax. +31 40 27 88399

New Zealand: 2 Wagener Place, C.P.O. Box 1041, AUCKLAND,
Tel. +64 9 849 4160, Fax. +64 9 849 7811

Norway: Box 1, Manglerud 0612, OSLO,
Tel. +47 22 74 8000, Fax. +47 22 74 8341

Philippines: Philips Semiconductors Philippines Inc.,
106 Valero St. Salcedo Village, P.O. Box 2108 MCC, MAKATI,
Metro MANILA, Tel. +63 2 816 6380, Fax. +63 2 817 3474

Poland: Ul. Lukiska 10, PL 04-123 WARSZAWA,
Tel. +48 22 612 2831, Fax. +48 22 612 2327

Portugal: see Spain

Romania: see Italy

Russia: Philips Russia, Ul. Usatcheva 35A, 119048 MOSCOW,
Tel. +7 095 247 9145, Fax. +7 095 247 9144

Singapore: Lorong 1, Toa Payoh, SINGAPORE 1231,
Tel. +65 350 2538, Fax. +65 251 6500

Slovakia: see Austria

Slovenia: see Italy

South Africa: S.A. PHILIPS Pty Ltd., 195-215 Main Road Martindale,
2092 JOHANNESBURG, P.O. Box 7430 Johannesburg 2000,
Tel. +27 11 470 5911, Fax. +27 11 470 5494

South America: Rua do Rocio 220, 5th floor, Suite 51,
04552-903 São Paulo, SÃO PAULO - SP, Brazil,
Tel. +55 11 821 2333, Fax. +55 11 829 1849

Spain: Balmes 22, 08007 BARCELONA,
Tel. +34 3 301 6312, Fax. +34 3 301 4107

Sweden: Kottbygatan 7, Akalla, S-16485 STOCKHOLM,
Tel. +46 8 632 2000, Fax. +46 8 632 2745

Switzerland: Allmendstrasse 140, CH-8027 ZÜRICH,
Tel. +41 1 488 2686, Fax. +41 1 481 7730

Taiwan: PHILIPS TAIWAN Ltd., 23-30F, 66,
Chung Hsiao West Road, Sec. 1, P.O. Box 22978,
TAIPEI 100, Tel. +886 2 382 4443, Fax. +886 2 382 4444

Thailand: PHILIPS ELECTRONICS (THAILAND) Ltd.,
209/2 Sanpavuth-Bangna Road Prakanong, BANGKOK 10260,
Tel. +66 2 745 4090, Fax. +66 2 398 0793

Turkey: Talatpasa Cad. No. 5, 80640 GÜLTEPE/ISTANBUL,
Tel. +90 212 279 2770, Fax. +90 212 282 6707

Ukraine: PHILIPS UKRAINE, 4 Patrice Lumumba str., Building B, Floor 7,
252042 KIEV, Tel. +380 44 264 2776, Fax. +380 44 268 0461

United Kingdom: Philips Semiconductors Ltd., 276 Bath Road, Hayes,
MIDDLESEX UB3 5BX, Tel. +44 181 730 5000, Fax. +44 181 754 8421

United States: 811 East Arques Avenue, SUNNYVALE, CA 94088-3409,
Tel. +1 800 234 7381

Uruguay: see South America

Vietnam: see Singapore

Yugoslavia: PHILIPS, Trg N. Pasica 5/v, 11000 BEOGRAD,
Tel. +381 11 625 344, Fax.+381 11 635 777

For all other countries apply to: Philips Semiconductors, Marketing & Sales Communications,
Building BE-p, P.O. Box 218, 5600 MD EINDHOVEN, The Netherlands, Fax. +31 40 27 24825

Internet: http://www.semiconductors.philips.com

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