

# DATA SHEET

## **KM110BH/2130; KM110BH/2190** Angle sensor hybrid

Product specification  
Supersedes data of 1994 Nov 12  
File under Discrete Semiconductors, SC17

1998 Mar 26

# Angle sensor hybrid

# KM110BH/2130; KM110BH/2190

## DESCRIPTION

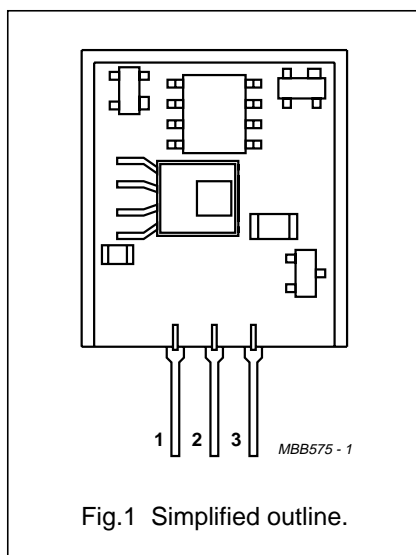
Sensor module for contactless measurement of angular displacements of strong magnetic fields. The module is a ready-trimmed (sensitivity and zero point) combination of the magnetoresistive sensor KMZ10B and a signal conditioning circuit in hybrid technology. The KM110BH/2130 delivers a linear output 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 <sub>CC</sub>
3	V <sub>O</sub>

## PIN CONFIGURATION



## QUICK REFERENCE DATA

SYMBOL	PARAMETER	MIN.	TYP.	MAX.	UNIT
V <sub>CC</sub>	DC supply voltage	–	5	–	V
V <sub>O</sub>	output voltage range	0.5	–	4.5	V
α	angle range				
	KM110BH/2130	–15	–	+15	deg
	KM110BH/2190	–45	–	+45	deg
T <sub>op</sub>	operating temperature	–40	–	+125	°C

## LIMITING VALUES

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

SYMBOL	PARAMETER	MIN.	MAX.	UNIT
V <sub>CC</sub>	supply voltage	4.5	5.5	V
I <sub>CC</sub>	supply current	–	20	mA
T <sub>stg</sub>	storage temperature	–40	+125	°C
T <sub>op</sub>	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.

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**CHARACTERISTICS**

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$\alpha$	angle range (note 1) KM110BH/2130	note 2	-15	-	+15	deg
	KM110BH/2190		-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	$\alpha = 0\text{ deg}$	-	2.5	-	V
$V_{off}$	zero point offset voltage KM110BH/2130		-45	-	+45	mV
	KM110BH/2190		-	$\pm 35$	-	mV
S	sensitivity (note 3) KM110BH/2130	$\alpha = 0\text{ deg}$	-	139	-	mV/deg
	KM110BH/2190		-	70	-	mV/deg
FL	deviation of linearity (note 4) KM110BH/2130		-	-	$\pm 1$	%/FS
	KM110BH/2190		-	-	-	%/FS
$SP_{max}$	maximum angular speed KM110BH/2130		-	10	-	deg/ms
	KM110BH/2190		-	30	-	deg/ms
$R_L$	load resistance		10	-	-	k $\Omega$
<b>Temperature coefficients (-40 to +85 °C)</b>						
$TCV_{zero}$	temperature coefficient of zero point voltage KM110BH/2130		-	0.6	-	mV/K
	KM110BH/2190		-	0.3	-	mV/K
TCS	temperature coefficient of sensitivity		-	$\pm 200$	-	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  $\pm 46.5\text{ deg}$ .
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.

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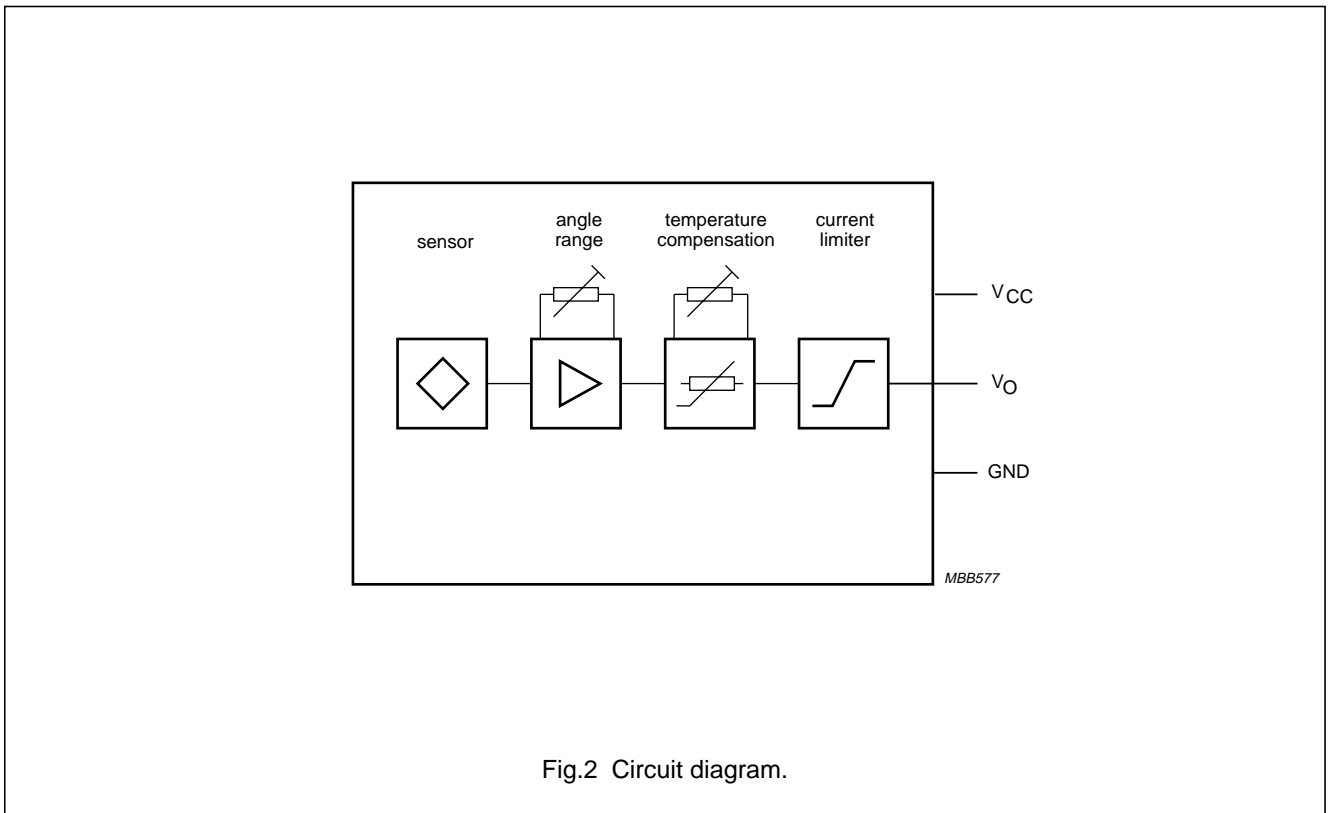


Fig.2 Circuit diagram.

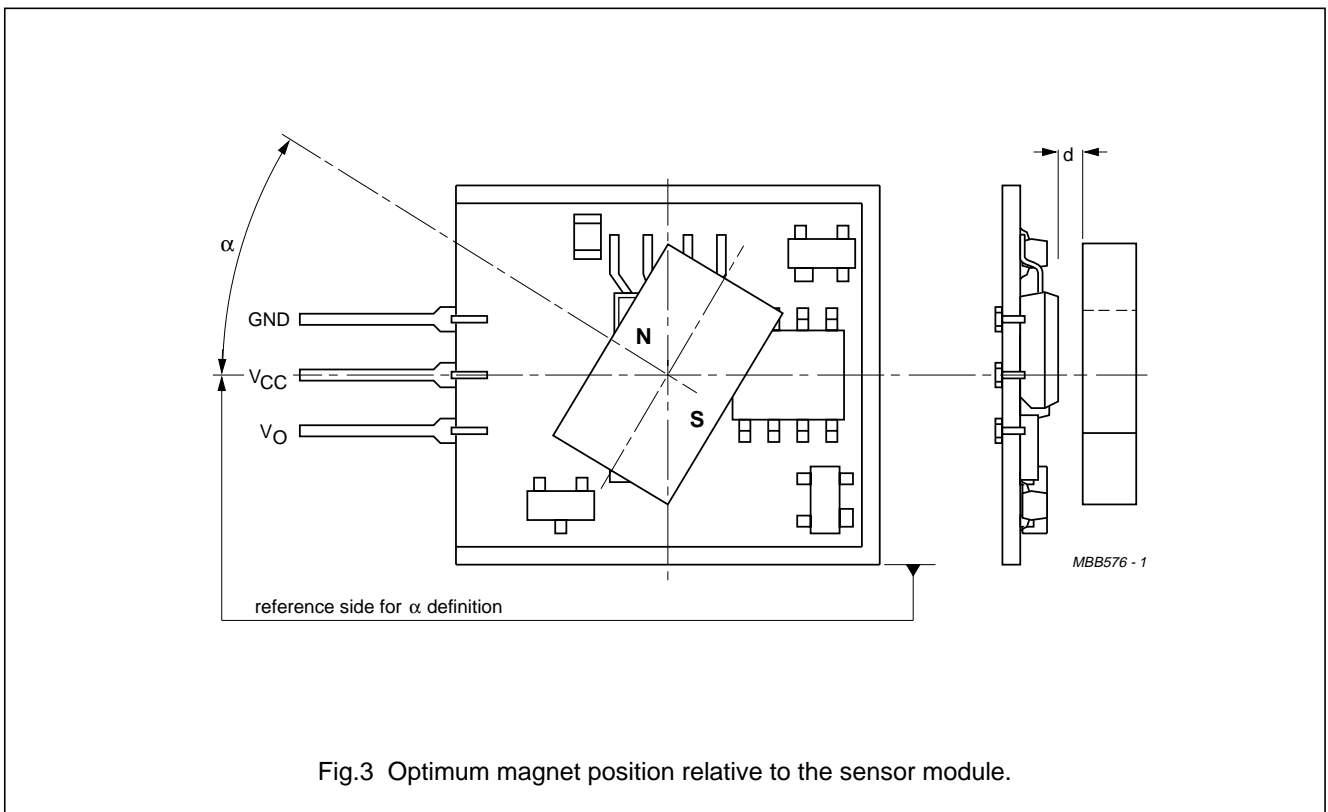
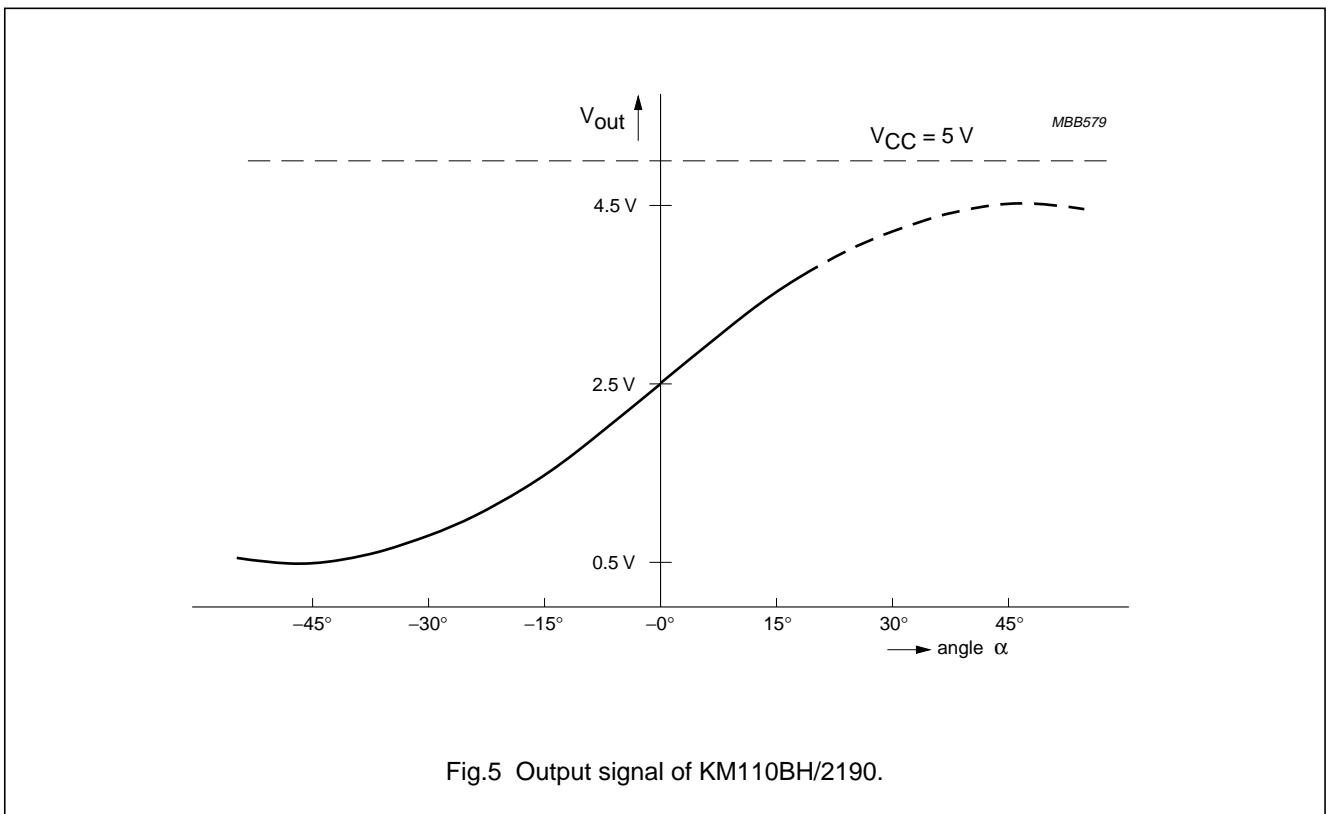
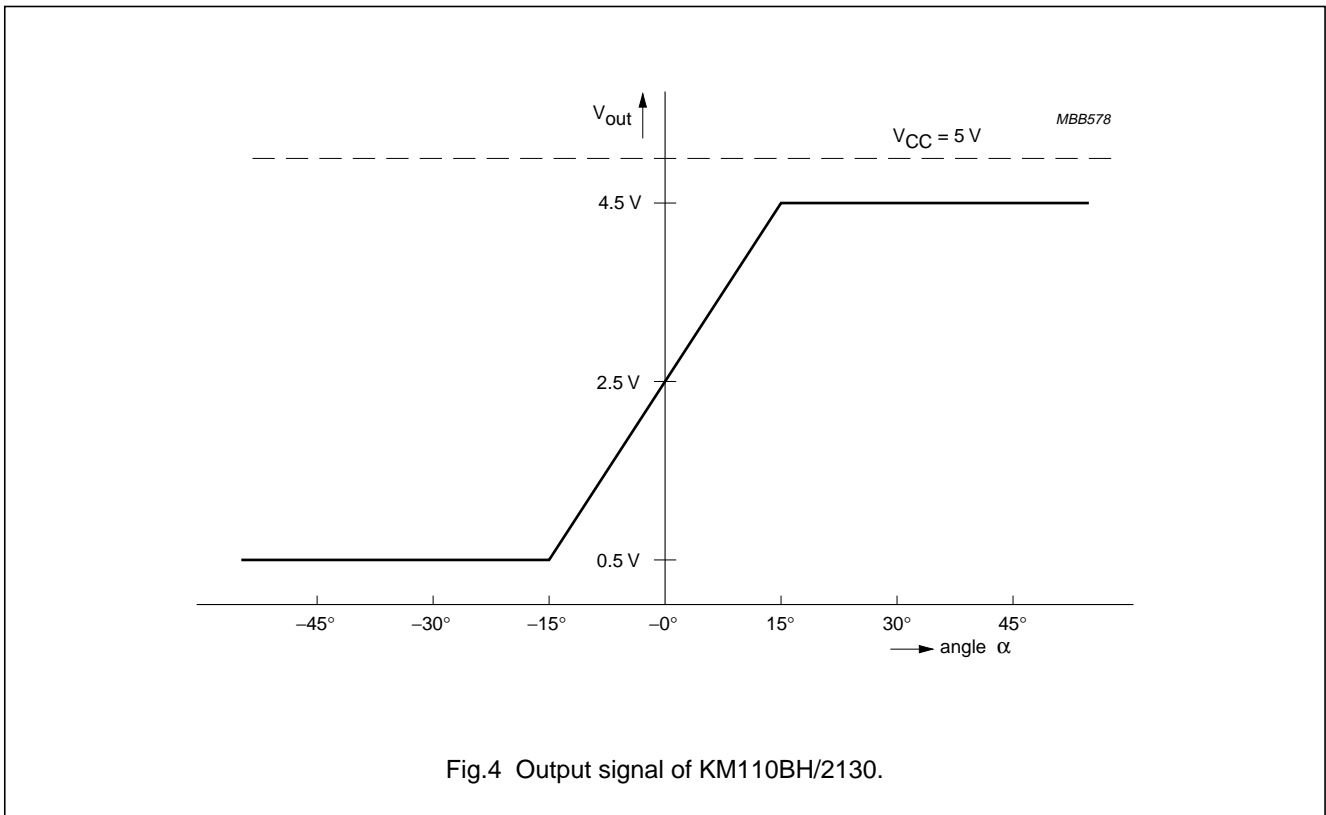


Fig.3 Optimum magnet position relative to the sensor module.

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**Table 1** Magnets for angle sensor hybrids

MAGNETS			HYBRID ANGLE SENSORS			
MATERIAL	DIMENSIONS <sup>(1)</sup> (mm)	TEMP. RANGE (°C)	DISTANCE d <sup>(2)</sup> (mm)	ANGLE RANGE CORRESPONDING TO V <sub>O</sub> = 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			

**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.

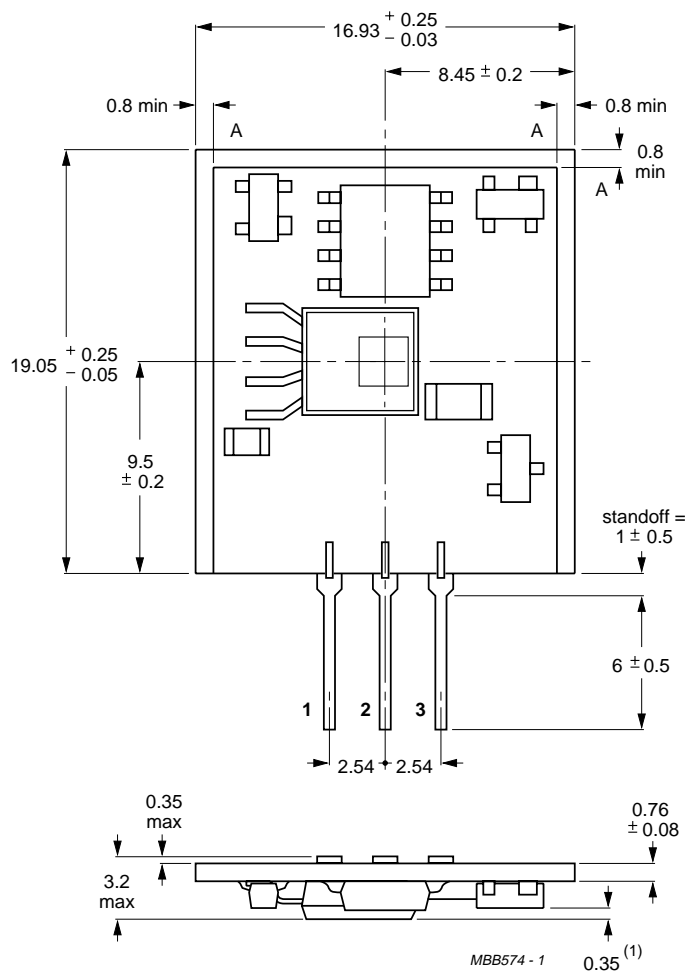
**APPLICATION**

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.

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PACKAGE OUTLINE



Dimensions in mm.  
 Area 'A' free of SMD devices.  
 (1) Sensitive layer below KMZ front.

Fig.6 KM110BH/2130; KM110BH/2190.

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**DEFINITIONS**

<b>Data sheet status</b>	
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.
<b>Limiting values</b>	
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.	
<b>Application information</b>	
Where application information is given, it is advisory and does not form part of the specification.	

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**NOTES**

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**NOTES**

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Printed in The Netherlands

115106/00/03/pp12

Date of release: 1998 Mar 26

Document order number: 9397 750 03627

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