

# DATA SHEET

**KM110BH/2270**

Angle sensor hybrid circuit

Preliminary specification  
File under Discrete Semiconductors, SC17

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**Philips Semiconductors**



**PHILIPS**

# Angle sensor hybrid circuit

# KM110BH/2270

## FEATURES

- Angle measuring range 70°
- Contactless, therefore wear-free and no micro-linearity problems
- Easy to mount, ready for use
- Analog current output signal
- Operating temperatures up to 100 °C
- EMC resistant
- Sample kit with magnet available.

## DESCRIPTION

Sensor module for contactless measurement of angular displacements of strong magnetic fields between -35° and +35°. 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 KMZ110BH/2270 delivers a sinusoidal current output signal which is a function of the direction of the magnetic field. The module can be used for contactless angle measurement.

## PIN OPTIONS

The KMZ110BH/2270 sensor hybrid is available with different electrical contacts.

- Stretched pins with a pitch of 2.54 mm. These pins are recommended for connector and/or cable connections.
- Double 's' bent pins (see Fig. 6) with a pitch of 5.71 mm. Bent pins are recommended for rigid soldered connections to compensate for mechanical stress. This hybrid circuit is available under type number KM110BH/2270G.

## PINNING

PIN	DESCRIPTION
1	ground
2	V <sub>CC</sub>
3	I <sub>o</sub>

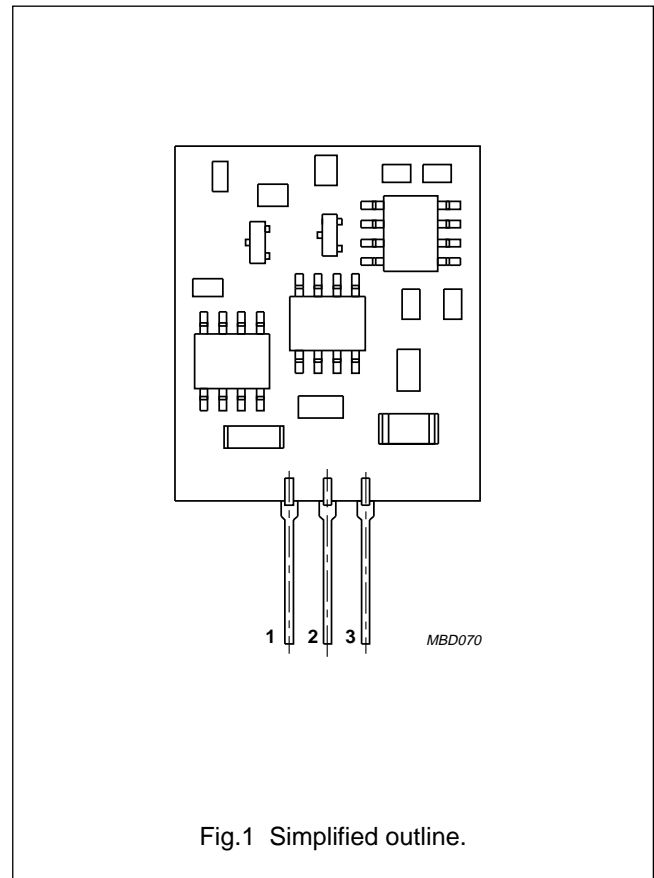


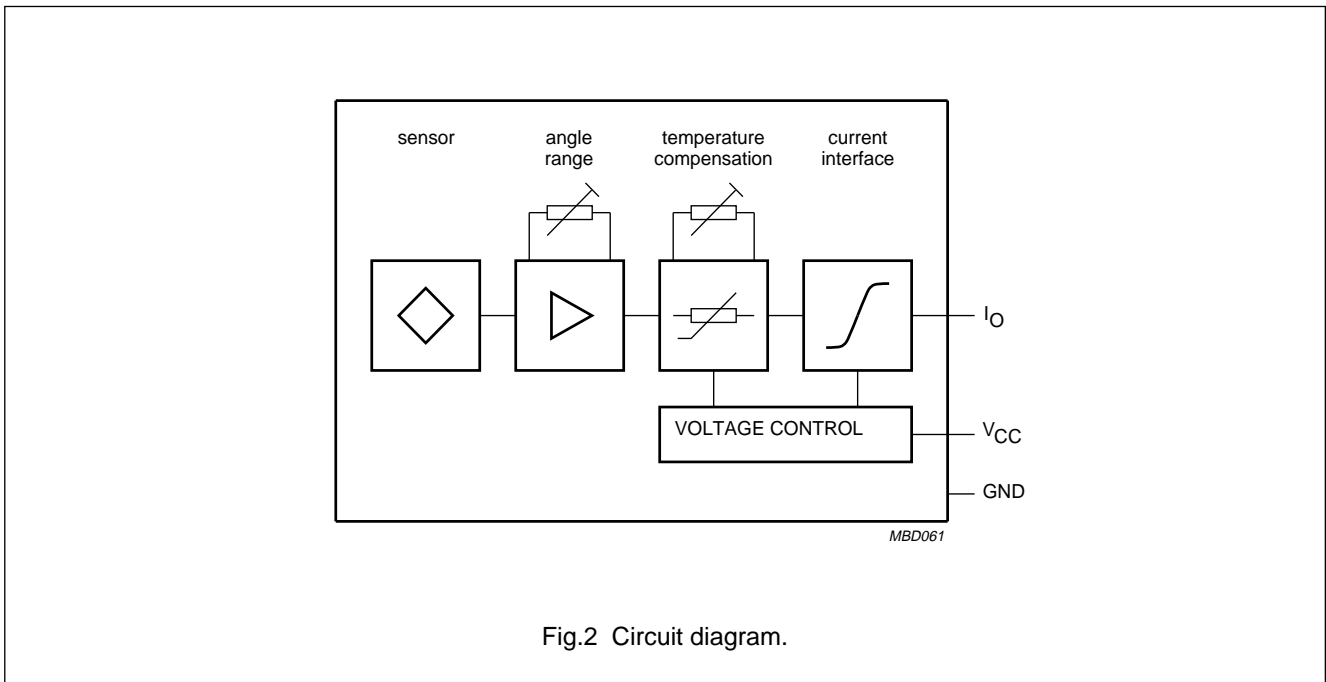
Fig.1 Simplified outline.

## QUICK REFERENCE DATA

SYMBOL	PARAMETER	MIN.	TYP.	MAX.	UNIT
V <sub>CC</sub>	DC supply voltage	-	8.5	-	V
I <sub>o</sub>	output current range	-	4 to 20	-	mA
α	angle range	-	-35 to +35	-	deg
T <sub>op</sub>	operating temperature	-40	-	+100	°C

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**LIMITING VALUES**

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

SYMBOL	PARAMETER	MIN.	MAX.	UNIT
$V_{CC}$	DC supply voltage	8.1	11	V
$I_{CC}$	supply current	–	40	mA
$T_{stg}$	storage temperature	–40	+125	°C
$T_{op}$	operating temperature	–40	+100	°C
	output short-circuit duration	permanent; 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**

$T_{amb} = 25\text{ °C}$ ;  $V_{CC} = 8.5\text{ V}$  and a homogeneous magnetic field  $H_{ext} = 100\text{ kA/m}$  in the sensitive layer of the KMZ10B sensor, unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$\alpha$	angle range	note 1	–	–35 to +35	–46.5 to +46.5	deg
$I_o$	output current range	note 2; sinusoidal, see Fig.4	–	4 to 20	3.2 to 20.8	mA
$I_{zero}$	zero point current	$\alpha = 0^\circ$	–	12	–	mA
$I_{offset}$	zero point offset current		–	$\pm 120$	–	$\mu\text{A}$
S	sensitivity	$\alpha = 0^\circ$ ; note 3	0.289	0.292	0.295	mA/deg
Rp	reproducibility	$\alpha = 0^\circ$ ; note 4	–	<0.001	–	deg
Rs	resolution	$\alpha = 0^\circ$ ; note 5	–	<0.001	–	deg
Rhy	hysteresis	$\alpha = 0^\circ$ ; note 6	–	<0.05	–	deg
SP <sub>max</sub>	maximum angular speed		–	20	–	deg/ms
R <sub>L</sub>	load resistance		–	200	220	$\Omega$
<b>Temperature coefficients (–40 to +85 °C)</b>						
TCI <sub>zero</sub>	temperature coefficient of zero point current		–	$\pm 1.5$	–	$\mu\text{A/K}$
TCS	temperature coefficient of sensitivity		–	$\pm 100$	–	ppm/K

**Note**

1. Refer to Fig.3. The magnetic field  $H_{ext} = 100\text{ kA/m}$  can be achieved using the magnets listed in Table 1.
2. Maximum values refer to  $\pm 46.5^\circ$  including offset and sensitivity tolerances.
3. The sensitivity will change slightly with +0.33% per 10% magnetic field increase if  $H_{ext}$  deviates from 100 kA/m.
4. Difference in output signal (expressed in degrees) between two zero point ( $\alpha = 0$ ) measurements, in which the zero point is approached from the same side of the measuring range (e.g. cycle:  $+35^\circ \rightarrow 0^\circ \rightarrow +35^\circ \rightarrow 0^\circ$ ).
5. The smallest detectable change of angle  $\Delta\alpha$  for  $\alpha = 0^\circ$  (cycle:  $0^\circ \rightarrow \Delta\alpha$ ).
6. As note 4, but with the zero point being approached from the upper end and lower end of the measuring range respectively (cycle:  $+35^\circ \rightarrow 0^\circ \rightarrow -35^\circ \rightarrow 0^\circ$ ).

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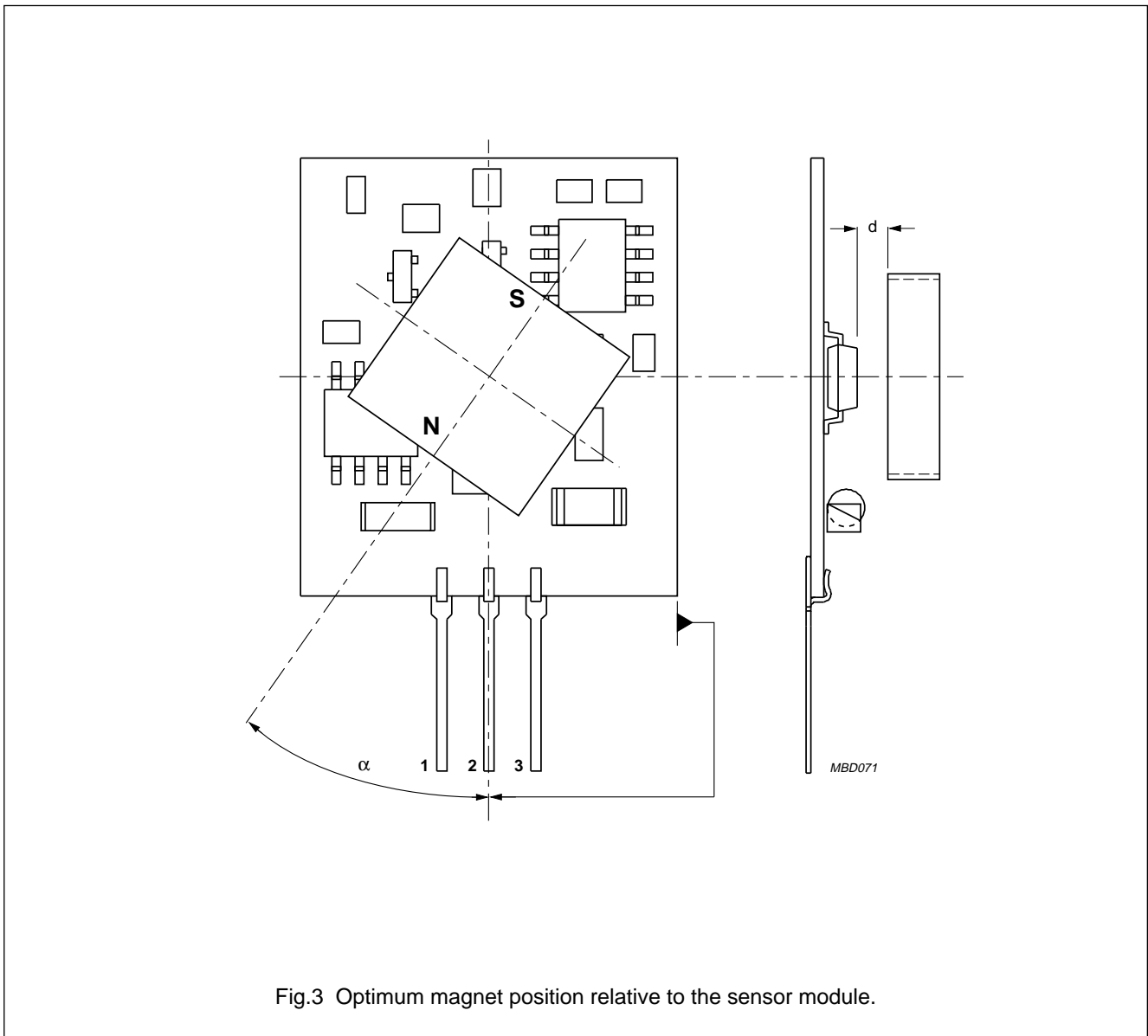


Fig.3 Optimum magnet position relative to the sensor module.

Angle sensor hybrid circuit

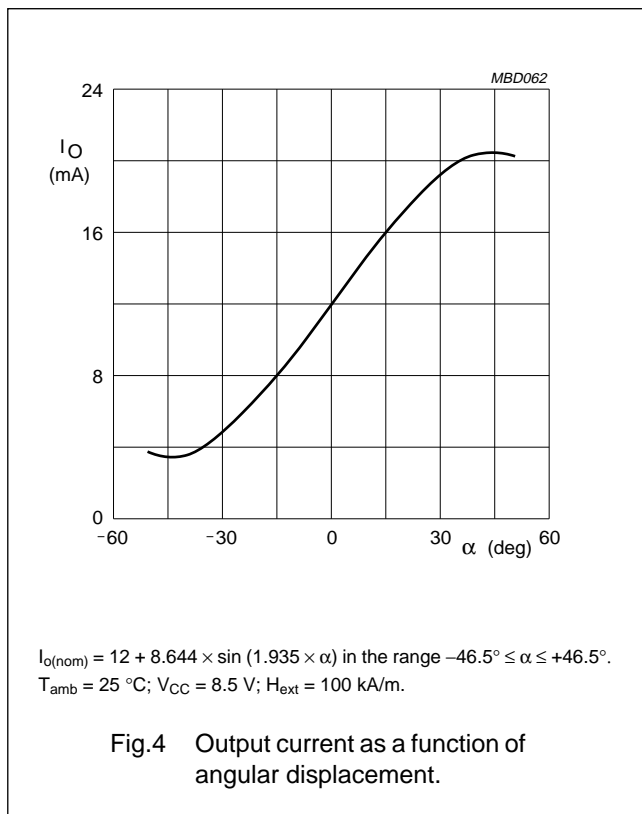
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**Table 1** Magnets for angle sensor hybrid.

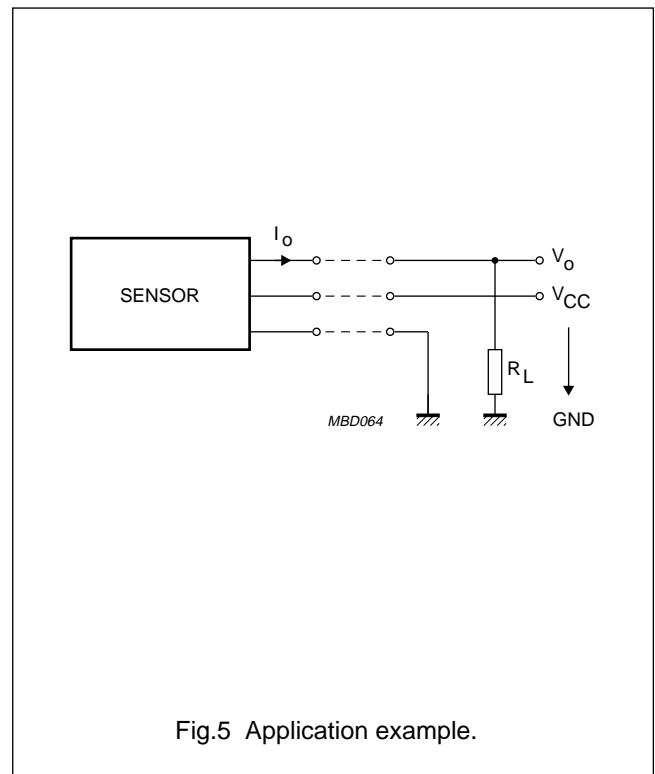
MATERIAL	DIMENSIONS (note 1) (mm)	DISTANCE 'd' (note 2) (mm)	TOLERANCE OF 'd' (note 3) (mm)	EXCENTRICITY (note 4) (mm)	TEMPERATURE RANGE (°C)
Sm <sub>2</sub> Co <sub>17</sub>	11.2 x 5.5 x 8	2.1	±0.30	±0.25	-55 to +125
	6 x 3 x 5	0.7	±0.15	±0.15	
	8 x 3 x 7.5	0.5	±0.30	±0.20	

**Notes**

1. The magnetization is always parallel to the latter given dimensions.
2. Between magnet and KMZ11B1 sensor front as shown in Fig.3.
3. Maximum deviation of distance 'd' for which the change in sensor output signal is smaller than 0.5% of full scale sensor signal.
4. Maximum deviation of magnet rotational axis to sensor rotational axis for which the change in sensor output signal is smaller than 0.5% of full scale sensor signal.



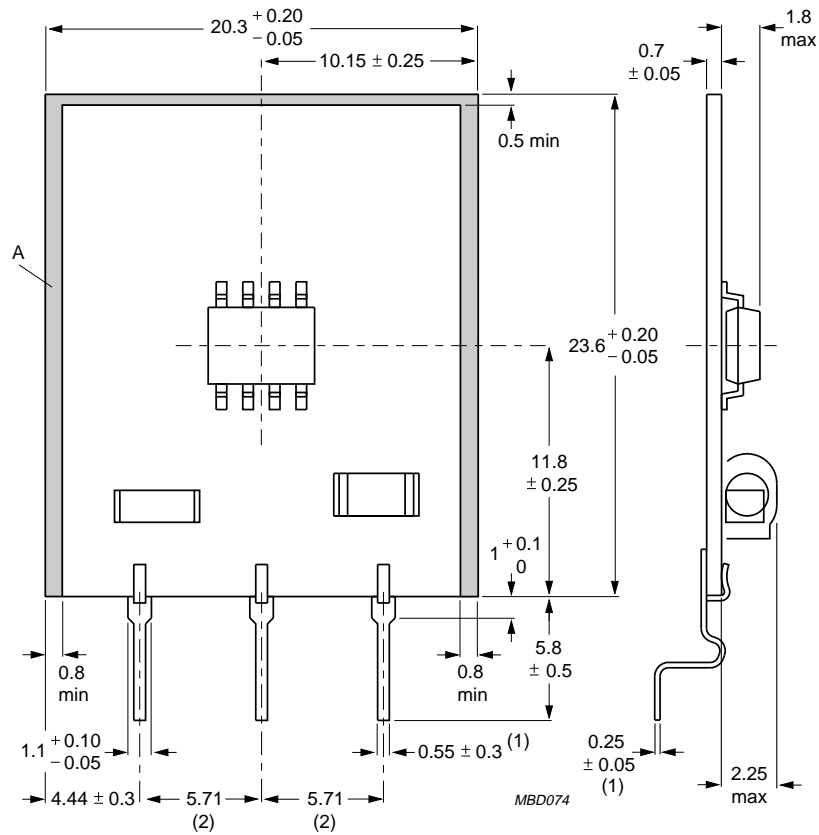
**APPLICATION INFORMATION**



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PACKAGE OUTLINE - BENT PIN OPTION



Dimensions in mm.

Area 'A' (shaded) free of SMD devices.

(1) Dimension before bath soldering; maximum dimension after bath soldering: 0.7 mm.

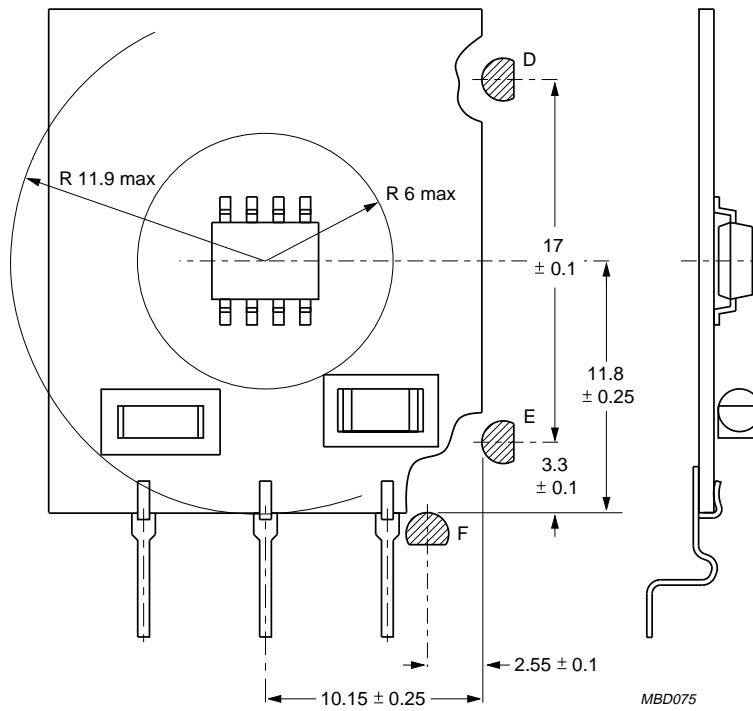
(2) Pitch tolerance: 0.2 mm.

Fig.6 KM110BH/2270G.

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REFERENCE DATA FOR THE ASSEMBLY AND MAGNET POSITIONING - BENT PIN OPTION



Dimensions in mm.

D,E: Definition of reference side for angle  $\alpha$ .

D,E,F: Reference points for sensor assembly.

Radii for free rotation of magnets due to height of the components on the hybrid circuit.

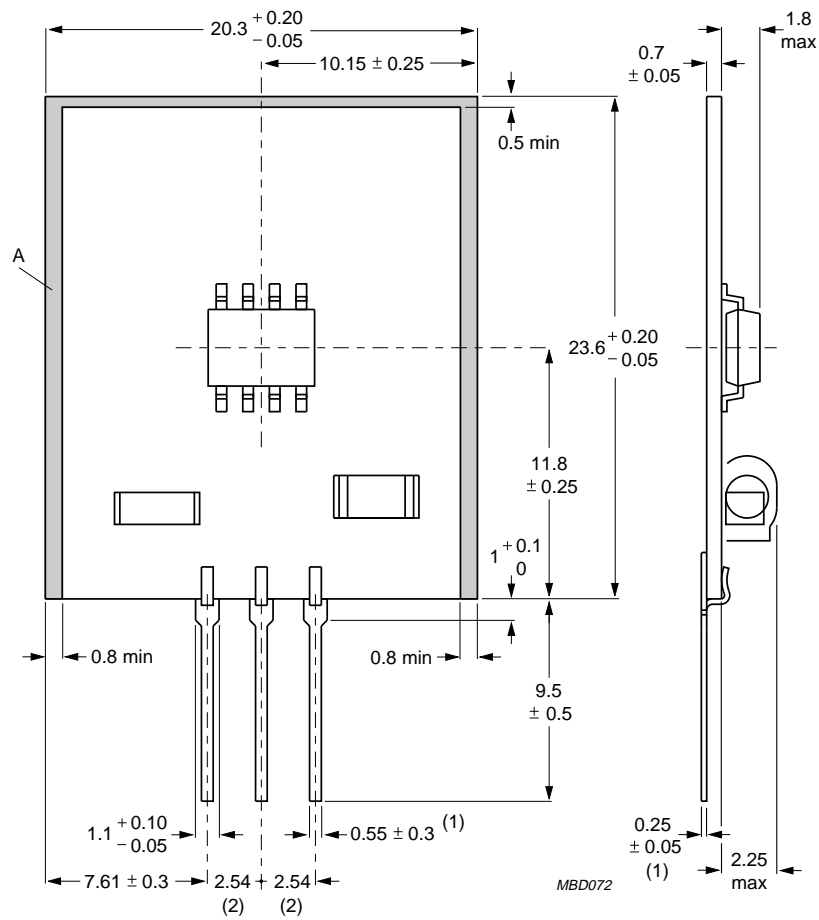
Fig.7 KM110BH/2270G.



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PACKAGE OUTLINE - STRETCHED PIN OPTION



Dimensions in mm.

Area 'A' (shaded) free of SMD devices.

(1) Dimension before bath soldering; maximum dimension after bath soldering: 0.7 mm.

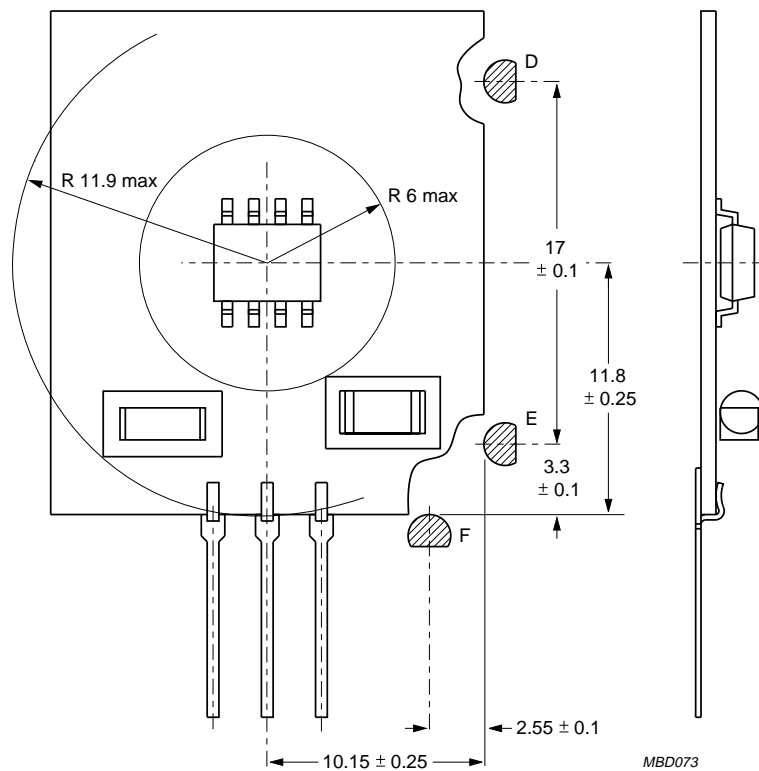
(2) Pitch tolerance: 0.2 mm.

Fig.8 KM110BH/2270.

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REFERENCE DATA FOR THE ASSEMBLY AND MAGNET POSITIONING - STRETCHED PIN OPTION



Dimensions in mm.

D,E: Definition of reference side for angle  $\alpha$ .

D,E,F: Reference points for sensor assembly.

Radii for free rotation of magnets due to height of the components on the hybrid circuit.

Fig.9 KM110BH/2270.

## Angle sensor hybrid circuit

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**DEFINITIONS**

<b>Data Sheets 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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