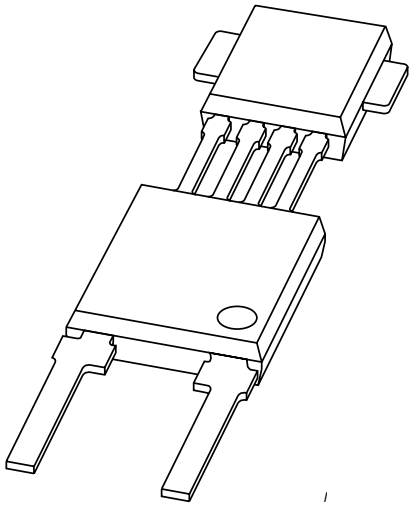
DATA SHEET



KMI15/2
Integrated rotational speed sensor

Product specification
Supersedes data of 1996 Dec 05
File under Discrete Semiconductors, SC17

1998 Mar 25

Philips
Semiconductors

PHILIPS

Integrated rotational speed sensor KMI15/2

FEATURES

- Digital current output signal
- Zero speed capability
- Wide air gap
- Wide temperature range
- Insensitive to vibration
- EMC resistant.

DESCRIPTION

The KMI15/2 sensor detects (rotational) speed and reference mark detection of magnetized targets(1). The sensor consists of a magnetoresistive sensor element, a signal conditioning integrated circuit in bipolar technology and a magnetized ferrite magnet.
The frequency of the digital current output signal is proportional to the rotational speed of a gear wheel.

CAUTION
Do not press two or more products together against their magnetic forces.

(1) The sensor contains a customized integrated circuit. Usage in hydraulic brake systems and in systems with active brake control is forbidden.

PINNING

PIN	DESCRIPTION
1	V_{CC}
2	V–

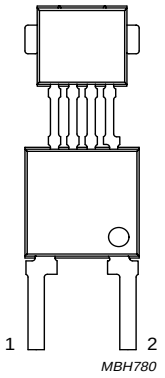


Fig.1 Simplified outline; (SOT453A).

QUICK REFERENCE DATA

SYMBOL	PARAMETER	MIN.	TYP.	MAX.	UNIT
V_{CC}	DC supply voltage	0.5	12	16	V
$I_{CC\ (low)}$	current output signal low	–	7	–	mA
$I_{CC\ (high)}$	current output signal high	–	14	–	mA
f_t	operating frequency	0	–	25000	Hz
T_{amb}	ambient operating temperature	–40	–	+85	°C

LIMITING VALUES

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{CC}	DC supply voltage	T_{amb} = –40 to +85 °C; R_L = 115 Ω	0.5	16	V
T_{stg}	storage temperature		–40	+150	°C
T_{amb}	operating ambient temperature		–40	+85	°C
T_{sld}	soldering temperature	t ≤ 10 s	–	260	°C
	output short-circuit duration to GND		continuous		

CHARACTERISTICS

T_{amb} = 25 °C; V_{CC} = 12 V; f_t = 2 kHz; test circuit: see Fig.7; R_L = 115 Ω.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$I_{CC\ (low)}$	current output signal low	see Fig.6	5.6	7.0	8.4	mA
$I_{CC\ (high)}$	current output signal high	see Fig.6	11.2	14.0	16.8	mA
t_r	output signal rise time	C_L = 100 pF; 10 to 90% value	–	0.5	–	µs
t_f	output signal fall time	C_L = 100 pF; 10 to 90% value	–	0.7	–	µs
t_d	switching delay time	between stimulation pulse (generated by a coil) and output signal	–	1	–	µs
f_t	operating frequency	for both rotation directions	0	–	25000	Hz
Hs_{LH}	magnetic switching field strength		0.05	0.3	0.8	kA/m
Hs_{HL}	magnetic switching field strength		0.05	0.3	0.8	kA/m
Hs	magnetic switching hysteresis		0.15	–	1.6	kA/m

FUNCTIONAL DESCRIPTION

The KMI15/2 sensor is sensitive to magnetic fields. The functional principle is shown in Fig.3. The field lines of a magnetized target are shown in Fig.3 as a straight target (it could also be circular e.g. for rotational speed measurement). If a sensor KMI15/2 is moved as shown in this field, either of the magnetic field components Hs_{HL} or Hs_{LH} is dominant, and forces the sensor to switch to either the high current (14 mA) or to the low current (7 mA). Oscillation of the sensor output signal is avoided by the implementation of a hysteresis into the signal conditioning electronic.

The MR sensor is stabilized by a permanent magnet applying a continuous magnetic field of ≥6 kA/m to the sensor. If the magnetic field given by the magnetized target errors like frequency doubling might occur.
The magnetoresistive sensor element signal is amplified, temperature compensated and forwarded to a Schmitt-trigger in the conditioning integrated circuit (Figs 4 and 5). The digital output signal levels (Fig.6) are independent of the magnetic field condition.
A (2-wire) output current enables safe transfer of the sensor signal to the detecting circuit (Fig.7).
The integrated circuit housing is separated from the sensor element housing to optimize the sensor behaviour at high temperatures.

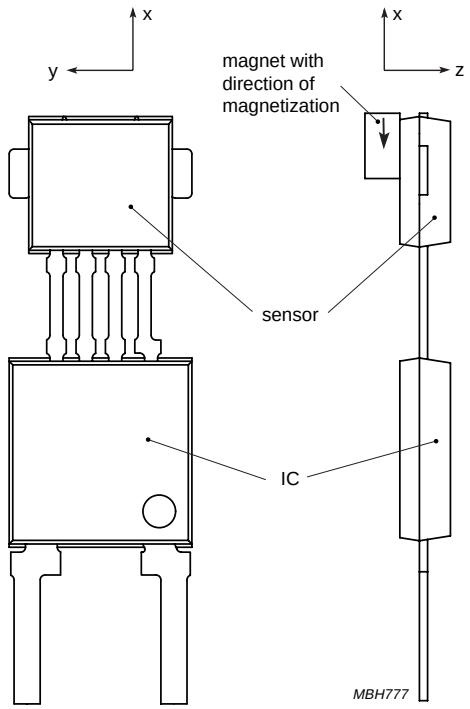


Fig.2 Component detail of the KMI15/2.

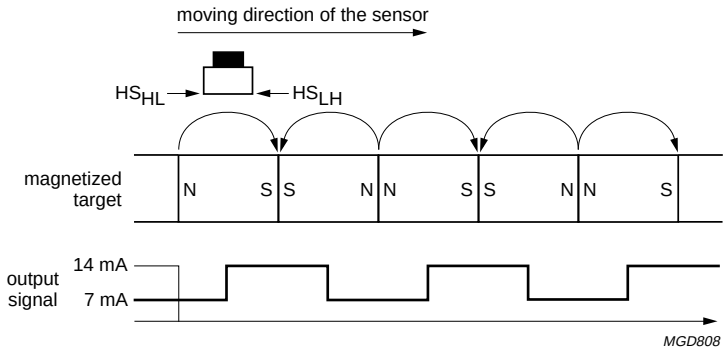


Fig.3 Functional principle of KMI15/2.

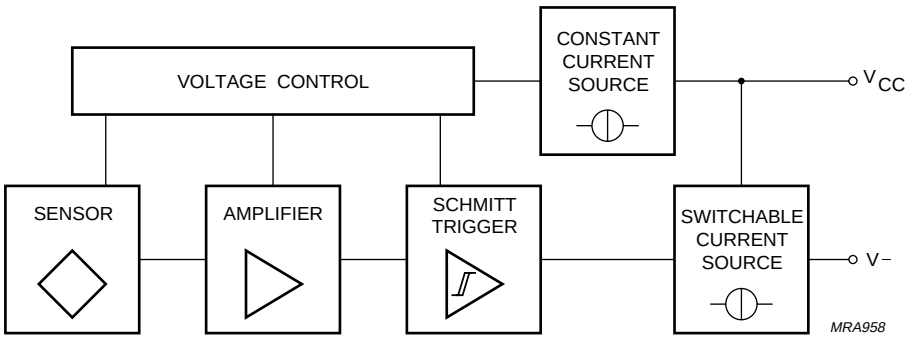


Fig.4 Block diagram.

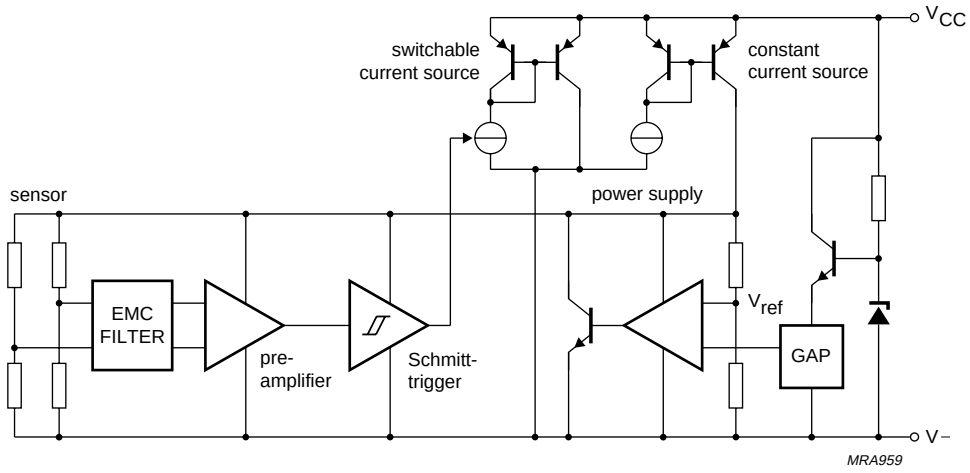
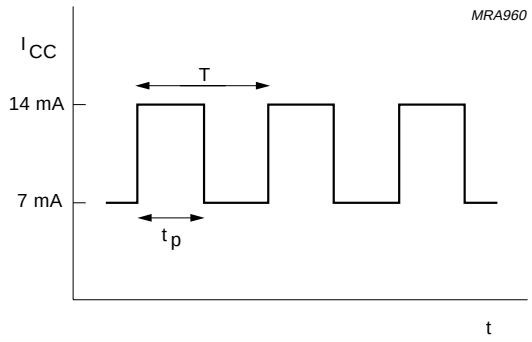


Fig.5 Simplified circuit diagram.



$$\delta = \frac{t_p}{T} \times 100\%$$

Fig.6 Output signal as a function of time.

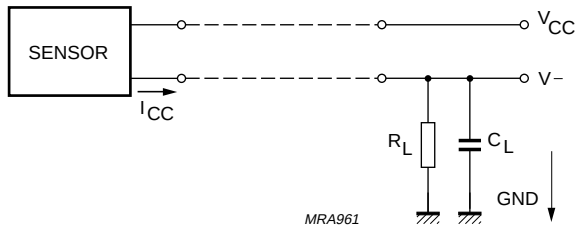
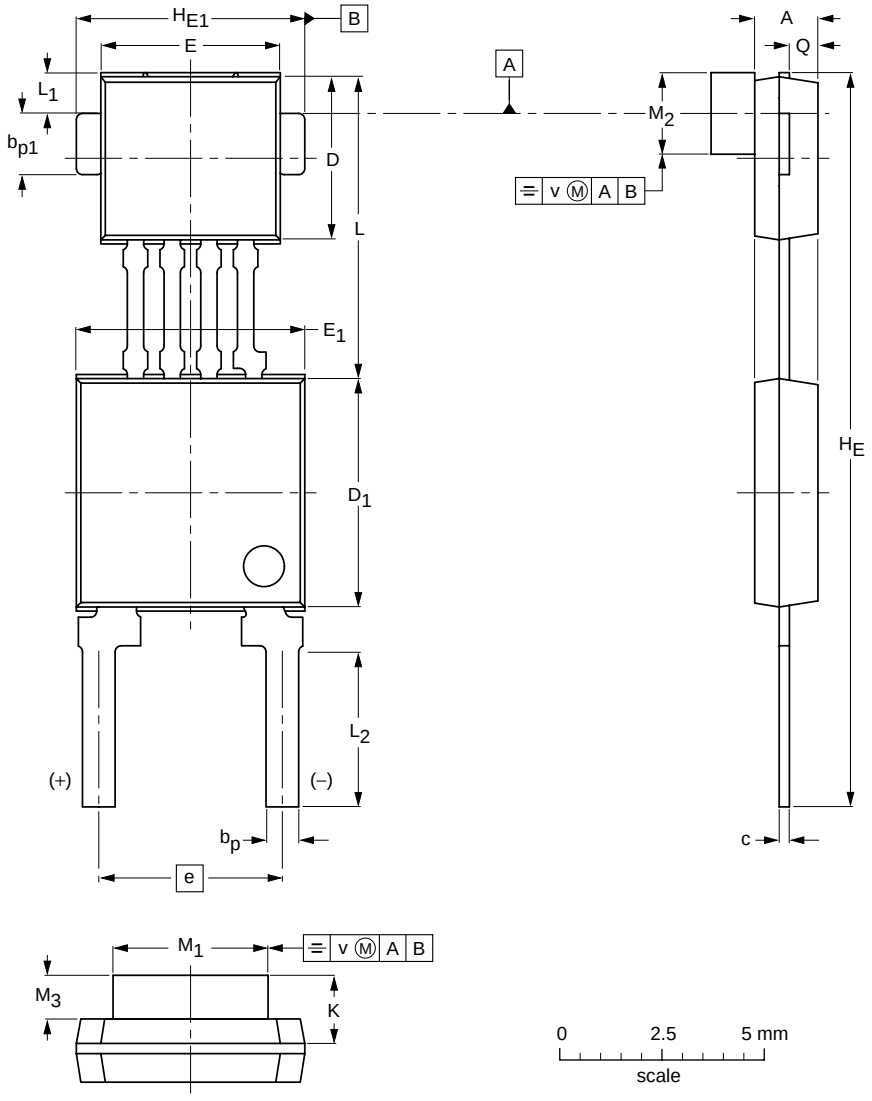


Fig.7 Test and application circuit.

PACKAGE OUTLINE

Plastic single-ended combined package; magnetoresistive sensor element; bipolar IC; magnetized ferrite magnet (3.8 x 2.0 x 0.8 mm); 2 in-line leads **SOT453A**



DIMENSIONS (mm are the original dimensions)

UNIT	A	b_p	b_{p1}	c	$D^{(1)}$	$D_1{}^{(1)}$	$E^{(1)}$	$E_1{}^{(1)}$	e	H_E	H_{E1}	K max.	L	L_1	L_2	M_1	M_2	M_3	Q	v
mm	1.7 1.4	0.8 0.7	1.5 1.4	0.3 0.24	4.1 3.9	5.7 5.5	4.5 4.3	5.7 5.5	4.6 4.4	18.2 17.8	5.6 5.5	1.67	7.55 7.25	1.2 0.9	3.9 3.5	3.9 3.7	2.1 1.9	0.9 0.75	0.75 0.65	0.25

Note

1. Plastic or metal protrusions of 0.15 mm maximum per side are not included.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT453A						~~96-11-12~~ 97-02-28

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.	

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Belarus: Hotel Minsk Business Center, Bld. 3, r. 1211, Volodarski Str. 6,
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China/Hong Kong: 501 Hong Kong Industrial Technology Centre,
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Colombia: see South America

Czech Republic: see Austria

Denmark: Prags Boulevard 80, PB 1919, DK-2300 COPENHAGEN S,
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Finland: Sinikalliontie 3, FIN-02630 ESPOO,
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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,
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Hungary: see Austria

India: Philips INDIA Ltd, Shivsagar Estate, A Block, Dr. Annie Besant Rd.
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Israel: RAPAC Electronics, 7 Kehilat Saloniki St, TEL AVIV 61180,
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