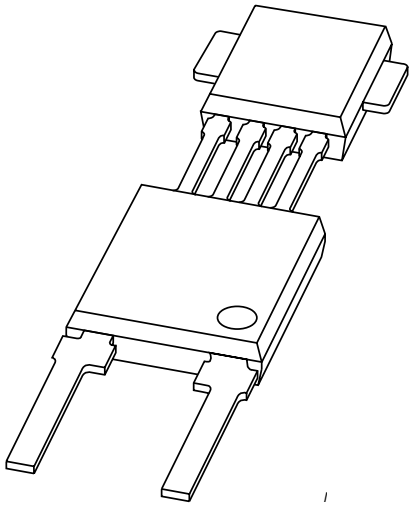
DATA SHEET



KMI15/2
Integrated rotational speed sensor

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

1998 Mar 25

Philips
Semiconductors

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–

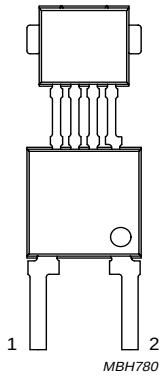


Fig.1 Simplified outline; (SOT453A).

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.

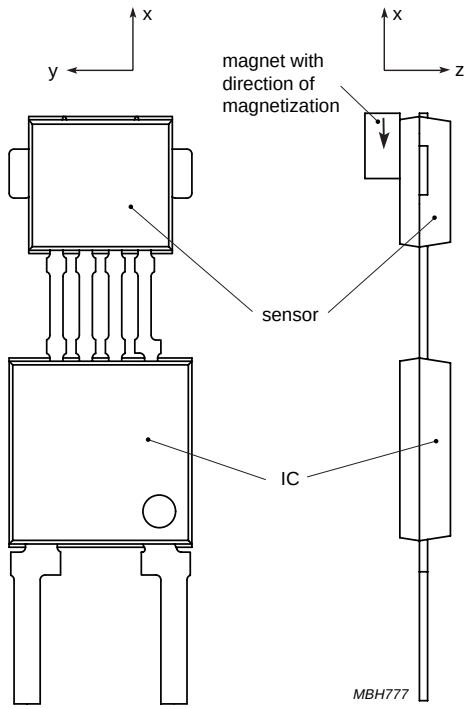


Fig.2 Component detail of the KMI15/2.

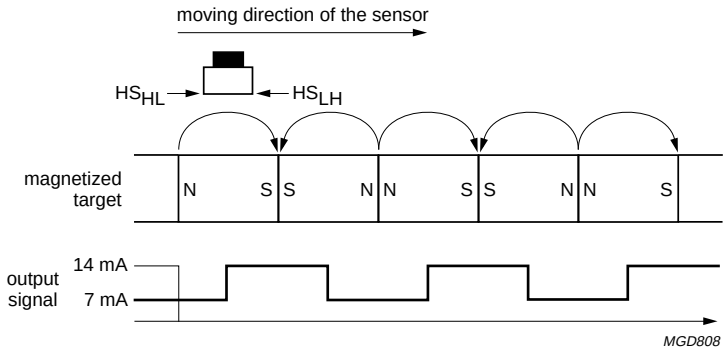


Fig.3 Functional principle of KMI15/2.

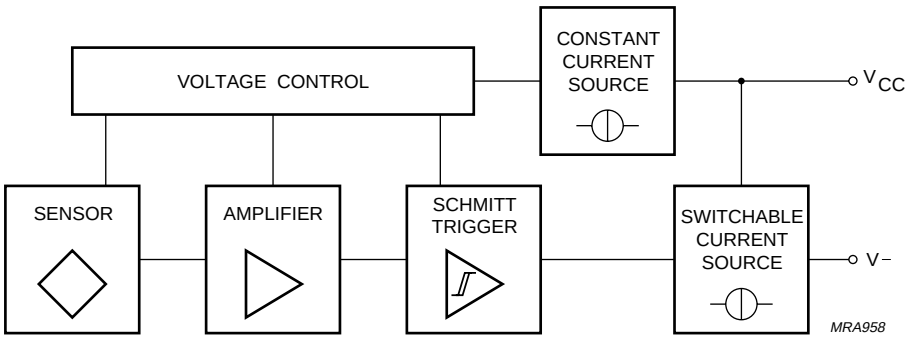


Fig.4 Block diagram.

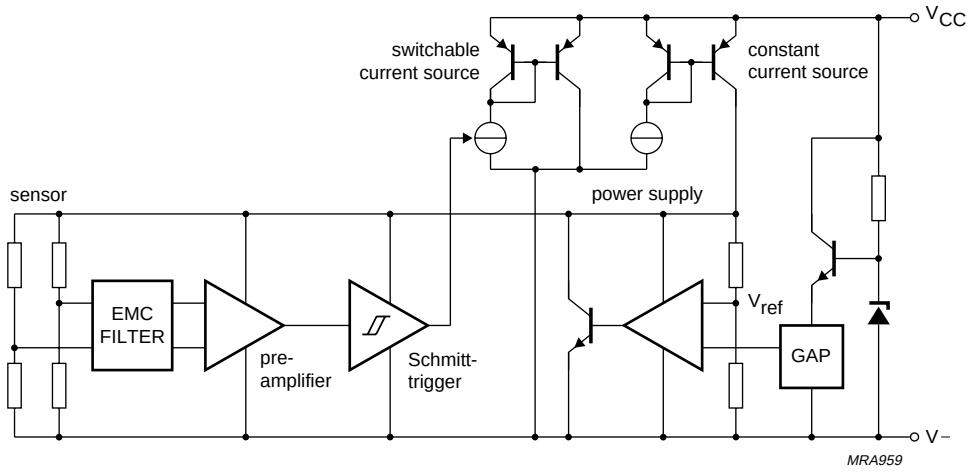
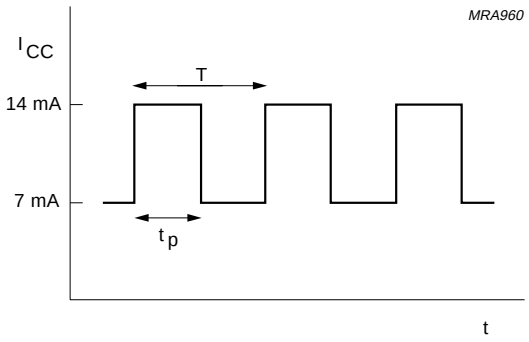


Fig.5 Simplified circuit diagram.



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

Fig.6 Output signal as a function of time.

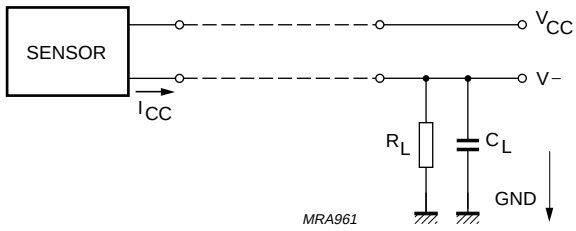
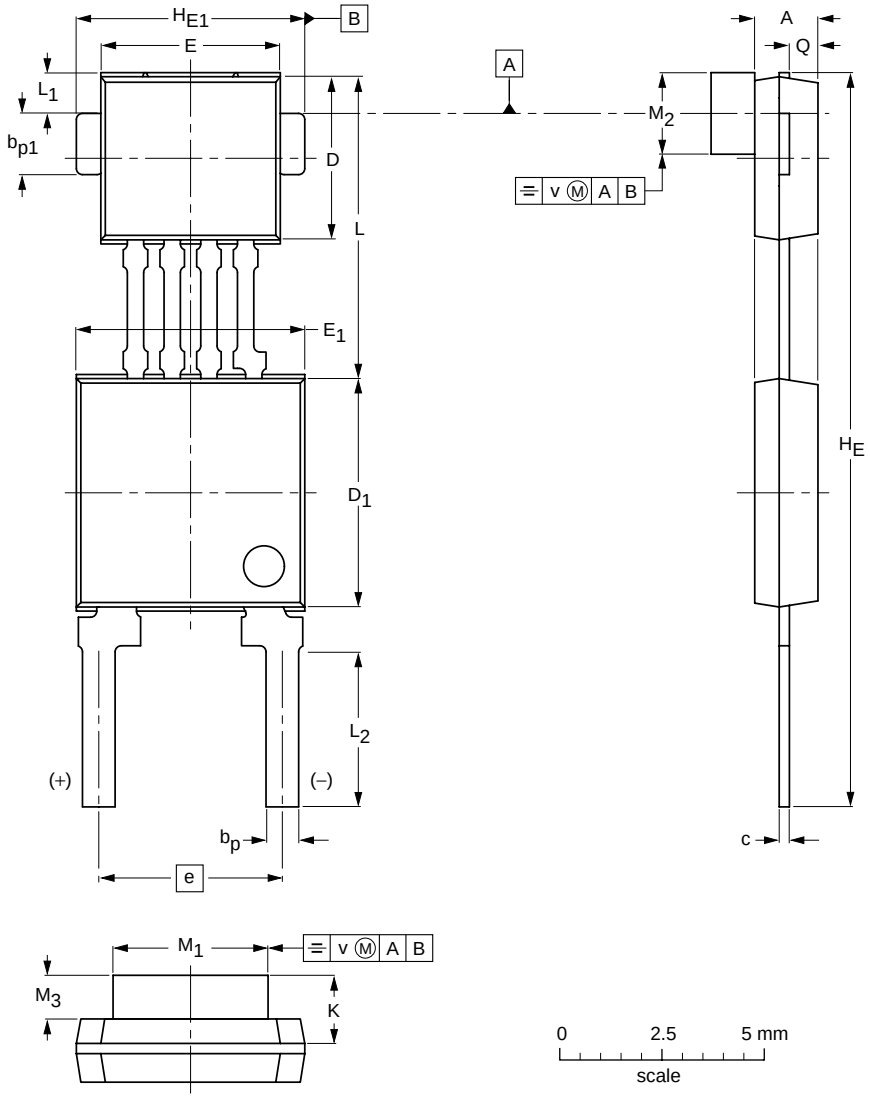


Fig.7 Test and application circuit.

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.	

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.

NOTES

NOTES

NOTES

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

SCA52

Printed in The Netherlands 115106/1200/02/pp12 Date of release: 1998 Mar 25 Document order number: 9397 750 03603

Let's make things better.

Philips Semiconductors

PHILIPS

SUNSTAR商斯达实业集团是集研发、生产、工程、销售、代理经销 、技术咨询、信息服务等为一体的高科技企业，是专业高科技电子产品生产厂家，是具有 10 多年历史的专业电子元器件供应商，是中国最早和最大的仓储式连锁规模经营大型综合电子零部件代理分销商之一,是一家专业代理和分銷世界各大品牌IC芯片和電子元器件的连锁经营綜合性国际公司。在香港、北京、深圳、上海、西安、成都等全国主要电子市场设有直属分公司和产品展示展销窗口门市部专卖店及代理分销商，已在全国范围内建成强大统一的供货和代理分销网络。 我们专业代理经销、开发生产电子元器件、集成电路、传感器、微波光电元器件、工控机/DOC/DOM电子盘、专用电路、单片机开发、MCU/DSP/ARM/FPGA软件硬件、二极管、三极管、模块等，是您可靠的一站式现货配套供应商、方案提供商、部件功能模块开发配套商。**专业以现代信息产业（计算机、通讯及传感器）三大支柱之一的传感器为主营业务，专业经营各类传感器的代理、销售生产、网络信息、科技图书资料及配套产品设计、工程开发。我们的专业网站——中国传感器科技信息网（全球传感器数据库） www.SENSOR-IC.COM 服务于全球高科技生产商及贸易商，为企业科技产品开发提供技术交流平台。欢迎各厂商互通有无、交换信息、交换链接、发布寻求代理信息。欢迎国外高科技传感器、变送器、执行器、自动控制产品厂商介绍产品到 中国，共同开拓市场。**本网站是关于各种传感器-变送器-仪器仪表及工业自动化大型专业网站,深入到工业控制、系统工程计 测计量、自动化、安防报警、消费电子等众多领域，把最新的传感器-变送器-仪器仪表买卖信息,最新技术供求,最新采购商,行业动态，发展方向，最新的技术应用和市场资讯及时的传递给广大科技开发、科学研究、产品设计人员。本网站已成功为石油、化工、电力、医药、生物、航空、航天、国防、能源、冶金、电子、工业、农业、交通、汽车、矿山、煤炭、纺织、信息、通信、IT、安防、环保、印刷、科研、气象、仪器仪表等领域从事科学研究、产品设计、开发、生产制造的科技人员、管理人员 、和采购人员提供满意服务。 **我公司专业开发生产、代理、经销、**销售各种传感器、变送器、敏感元器件、开关、执行器、仪器仪表、自动化控制系统： 专门从事设计、生产、销售各种传感器、变送器、各种测控仪表、热工仪表、现场控制器、计算机控制系统、数据采集系统、各类环境监控系统、专用控制系统应用软件以及嵌入式系统开发及应用等工作。如热敏电阻、压敏电阻、温度传感器、温度变送器、湿度传感器、 湿度变送器、气体传感器、 气体变送器、压力传感器、 压力变送、称重传感器、物（液）位传感器、物（液）位变送器、流量传感器、 流量变送器、电流（压）传感器、溶氧传感器、霍尔传感器 、图像传感器、超声波传感器、位移传感器、速度传感器、加速度传感器、扭距传感器、红外传感器、紫外传感器、 火焰传感器、激光传感器、振动传感器、轴角传感器、光电传感器、接近传感器、干簧管传感器、继电器传感器、微型电泵、磁敏（阻）传感器 、压力开关、接近开关、光电开关、色标传感器、光纤传感器、齿轮测速传感器、 时间继电器、计数器、计米器、温控仪、固态继电器、调压模块、电磁铁、电压表、电流表等特殊传感器 。 同时承接传感器应用电路、产品设计和自动化工程项目。

更多产品请看本公司产品专用销售网站:
商斯达中国传感器科技信息网：http://www.sensor-ic.com/
商斯达工控安防网：http://www.pc-ps.net/
商斯达电子 元器件网：http://www.sunstare.com/
商斯达微波光电产品网:HTTP://www.rfoe.net/
商斯达消费电子产品网://www.icasic.com/
商斯达军工产品网:http://www.junpinic.com/
商斯达实业科技产品网://www.sunstars.cn/传感器销售热线：

地址：深圳市福田区福华路福庆街鸿图大厦 1602 室
电话：0755-83607652 83376489 83376549 83370250 83370251 82500323
传真：0755-83376182 （0）13902971329 MSN: SUNS8888@hotmail.com
邮编：518033 E-mail:szss20@163.com QQ: 195847376
深圳赛格展销部：深圳华强北路赛格电子市场 2583 号 电话：0755-83665529 25059422
技术支持：0755-83394033 13501568376

欢迎索取免费详细资料、设计指南和光盘 ；产品凡多，未能尽录，欢迎来电查询。

北京分公司：北京海淀区知春路 132 号中发电子大厦 3097 号
TEL：010-81159046 82615020 13501189838 FAX：010-62543996
上海分公司：上海市北京东路 668 号上海賽格电子市场 D125 号
TEL：021-28311762 56703037 13701955389 FAX：021-56703037
西安分公司：西安高新开发区 20 所(中国电子科技集团导航技术研究所)
西安劳动南路 88 号电子商城二楼 D23 号
TEL：029-81022619 13072977981 FAX:029-88789382