

# DATA SHEET

## **PHP225**

Dual P-channel enhancement  
mode MOS transistor

Product specification  
Supersedes data of November 1994  
File under Discrete Semiconductors, SC13b

1997 Jun 20

# Dual P-channel enhancement mode MOS transistor

PHP225

## FEATURES

- High-speed switching
- No secondary breakdown
- Very low on-resistance.

## APPLICATIONS

- Motor and actuator driver
- Power management
- Synchronized rectification.

## DESCRIPTION

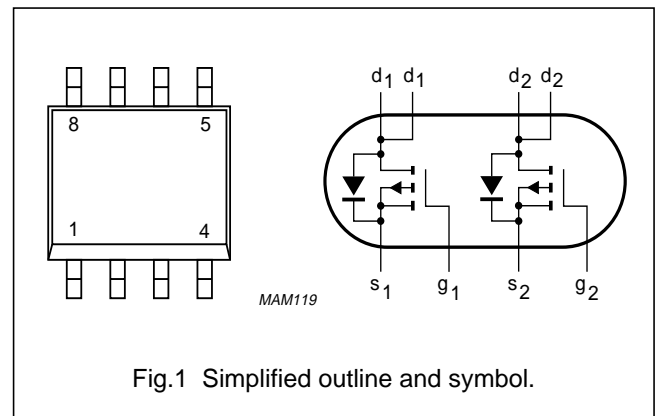
Two P-channel enhancement mode MOS transistors in an 8-pin plastic SOT96-1 (SO8) package.

**CAUTION**

The device is supplied in an antistatic package.  
The gate-source input must be protected against static discharge during transport or handling.

## PINNING - SOT96-1 (SO8)

PIN	SYMBOL	DESCRIPTION
1	s <sub>1</sub>	source 1
2	g <sub>1</sub>	gate 1
3	s <sub>2</sub>	source 2
4	g <sub>2</sub>	gate 2
5	d <sub>2</sub>	drain 2
6	d <sub>2</sub>	drain 2
7	d <sub>1</sub>	drain 1
8	d <sub>1</sub>	drain 1



## QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
<b>Per P-channel</b>					
V <sub>DS</sub>	drain-source voltage (DC)		–	–30	V
V <sub>SD</sub>	source-drain diode forward voltage	I <sub>S</sub> = –1.25 A	–	–1.6	V
V <sub>GSO</sub>	gate-source voltage (DC)	open drain	–	±20	V
V <sub>GSth</sub>	gate-source threshold voltage	I <sub>D</sub> = –1 mA; V <sub>DS</sub> = V <sub>GS</sub>	–1	–2.8	V
I <sub>D</sub>	drain current (DC)		–	–2.3	A
R <sub>DSon</sub>	drain-source on-state resistance	I <sub>D</sub> = –1 A; V <sub>GS</sub> = –10 V	–	0.25	Ω
P <sub>tot</sub>	total power dissipation	T <sub>s</sub> = 80 °C	–	2	W

## Dual P-channel enhancement mode MOS transistor

## PHP225

### LIMITING VALUES

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

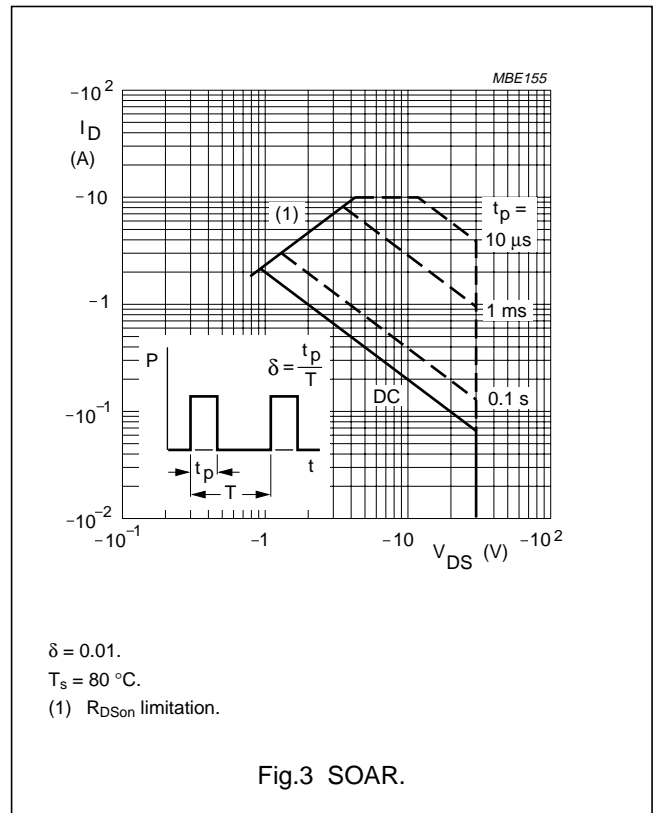
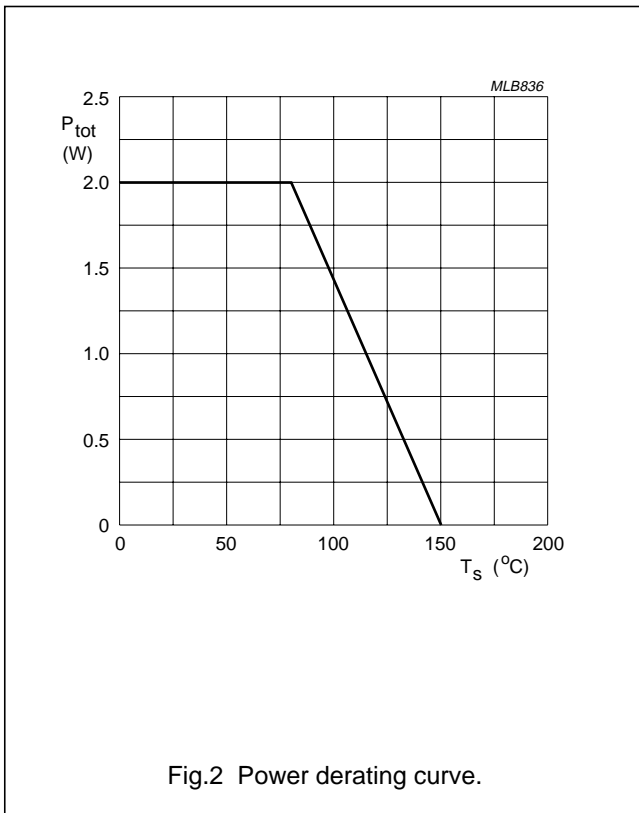
SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
<b>Per P-channel</b>					
$V_{DS}$	drain-source voltage (DC)		–	–30	V
$V_{GSO}$	gate-source voltage (DC)	open drain	–	±20	V
$I_D$	drain current (DC)	$T_s \leq 80\text{ °C}$	–	–2.3	A
$I_{DM}$	peak drain current	note 1	–	–10	A
$P_{tot}$	total power dissipation	$T_s = 80\text{ °C}$ ; note 2	–	2	W
		$T_{amb} = 25\text{ °C}$ ; note 3	–	2	W
		$T_{amb} = 25\text{ °C}$ ; note 4	–	1	W
		$T_{amb} = 25\text{ °C}$ ; note 5	–	1.3	W
$T_{stg}$	storage temperature		–65	+150	°C
$T_j$	operating junction temperature		–	150	°C
<b>Source-drain diode</b>					
$I_S$	source current (DC)	$T_s \leq 80\text{ °C}$	–	–1.25	A
$I_{SM}$	peak pulsed source current	note 1	–	–5	A

### Notes

1. Pulse width and duty cycle limited by maximum junction temperature.
2. Maximum permissible dissipation per MOS transistor. Both devices may be loaded up to 2 W at the same time.
3. Maximum permissible dissipation per MOS transistor. Device mounted on printed-circuit board with an  $R_{th\ a-tp}$  (ambient to tie-point) of 27.5 K/W.
4. Maximum permissible dissipation per MOS transistor. Device mounted on printed-circuit board with an  $R_{th\ a-tp}$  (ambient to tie-point) of 90 K/W.
5. Maximum permissible dissipation if only one MOS transistor dissipates. Device mounted on printed-circuit board with an  $R_{th\ a-tp}$  (ambient to tie-point) of 90 K/W.

Dual P-channel enhancement mode MOS transistor

PHP225



## Dual P-channel enhancement mode MOS transistor

## PHP225

### THERMAL CHARACTERISTICS

SYMBOL	PARAMETER	VALUE	UNIT
$R_{th\ j-s}$	thermal resistance from junction to soldering point	35	K/W

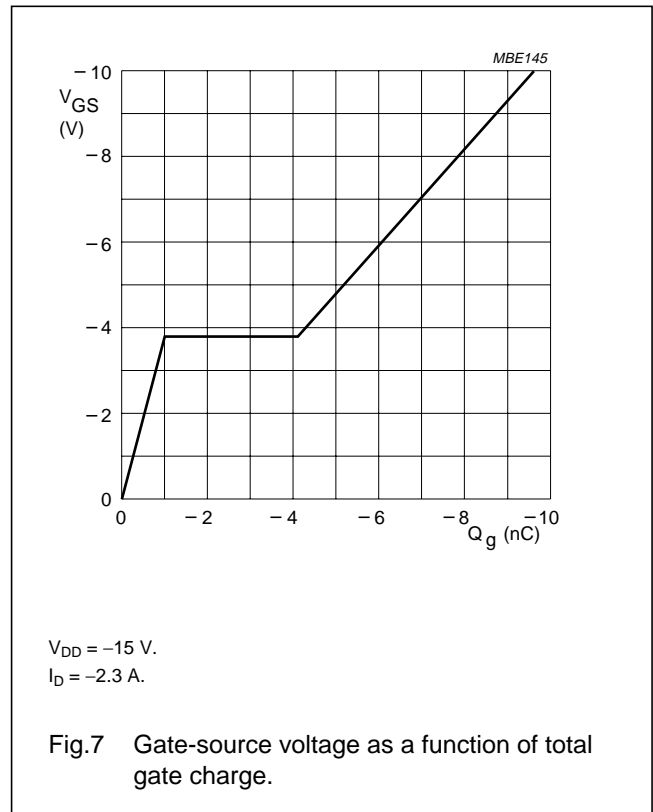
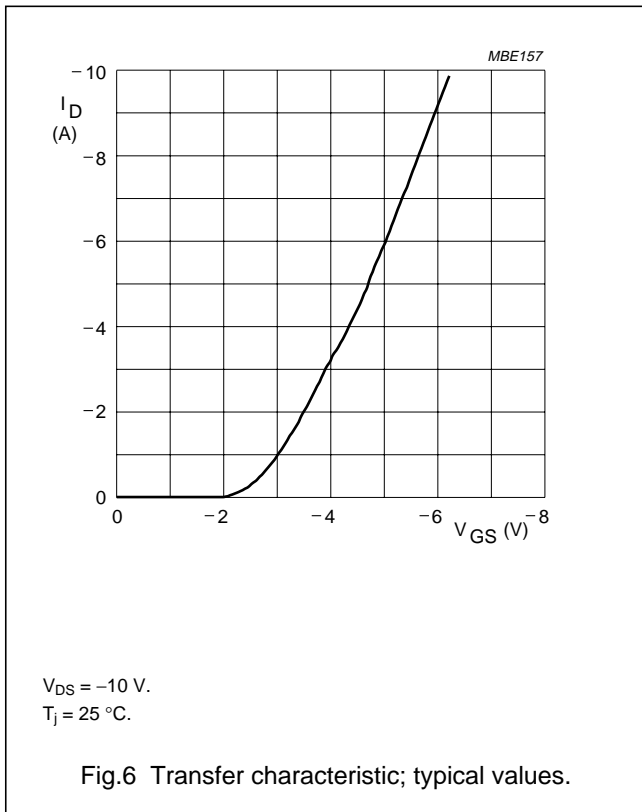
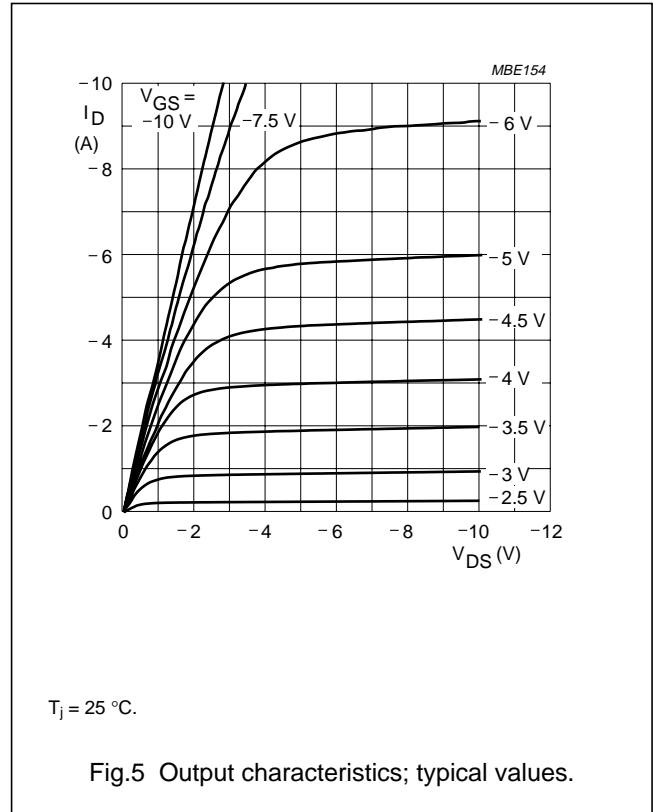
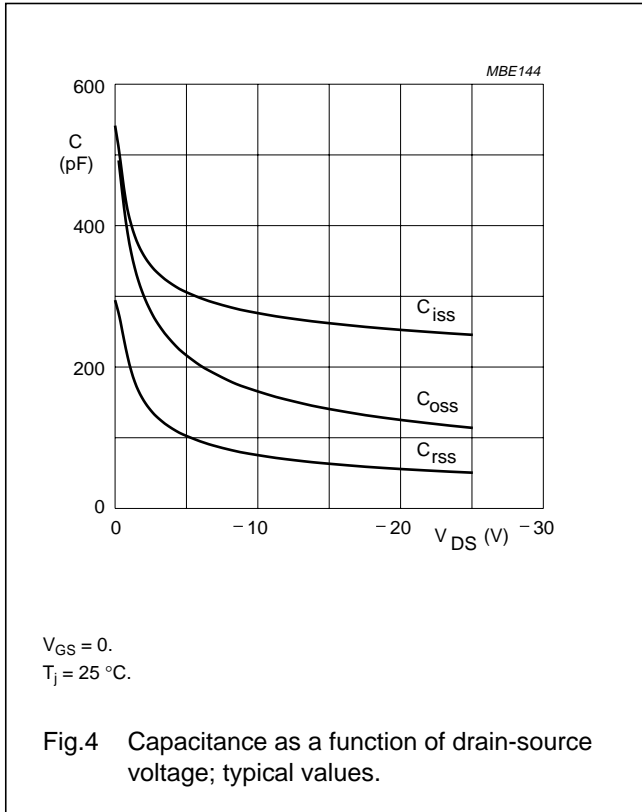
### CHARACTERISTICS

$T_j = 25\text{ °C}$  unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
<b>Per P-channel</b>						
$V_{(BR)DSS}$	drain-source breakdown voltage	$V_{GS} = 0; I_D = -10\ \mu A$	-30	–	–	V
$V_{GSth}$	gate-source threshold voltage	$V_{GS} = V_{DS}; I_D = -1\ mA$	-1	–	-2.8	V
$I_{DSS}$	drain-source leakage current	$V_{GS} = 0; V_{DS} = -24\ V$	–	–	-100	nA
$I_{GSS}$	gate leakage current	$V_{GS} = \pm 20\ V; V_{DS} = 0$	–	–	$\pm 100$	nA
$I_{Don}$	on-state drain current	$V_{GS} = -10\ V; V_{DS} = -1\ V$	-2.3	–	–	A
		$V_{GS} = -4.5\ V; V_{DS} = -5\ V$	-1	–	–	A
$R_{DSon}$	drain-source on-state resistance	$V_{GS} = -4.5\ V; I_D = -0.5\ A$	–	0.33	0.4	$\Omega$
		$V_{GS} = -10\ V; I_D = -1\ A$	–	0.22	0.25	$\Omega$
$ y_{fs} $	forward transfer admittance	$V_{DS} = -20\ V; I_D = -1\ A$	1	2	–	S
$C_{iss}$	input capacitance	$V_{GS} = 0; V_{DS} = -20\ V; f = 1\ MHz$	–	250	–	pF
$C_{oss}$	output capacitance	$V_{GS} = 0; V_{DS} = -20\ V; f = 1\ MHz$	–	140	–	pF
$C_{rss}$	reverse transfer capacitance	$V_{GS} = 0; V_{DS} = -20\ V; f = 1\ MHz$	–	50	–	pF
$Q_G$	total gate charge	$V_{GS} = -10\ V; V_{DS} = -15\ V;$ $I_D = -2.3\ A$	–	10	25	nC
$Q_{GS}$	gate-source charge	$V_{GS} = -10\ V; V_{DS} = -15\ V;$ $I_D = -2.3\ A$	–	1	–	nC
$Q_{GD}$	gate-drain charge	$V_{GS} = -10\ V; V_{DS} = -15\ V;$ $I_D = -2.3\ A$	–	3	–	nC
<b>Switching times</b>						
$t_{on}$	turn-on time	$V_{GD} = 0\ to\ -10\ V; V_{DD} = -20\ V;$ $I_D = -1\ A; R_L = 20\ \Omega$	–	20	80	ns
$t_{off}$	turn-off time	$V_{GS} = -10\ to\ 0\ V; V_{DD} = -20\ V;$ $I_D = -1\ A; R_L = 20\ \Omega$	–	50	140	ns
<b>Source-drain diode</b>						
$V_{DS}$	source drain diode forward voltage	$V_{GD} = 0; I_S = -1.25\ A$	–	–	-1.6	V
$t_{rr}$	reverse recovery time	$I_S = -1.25\ A; di/dt = 100\ A/\mu s$	–	150	200	ns

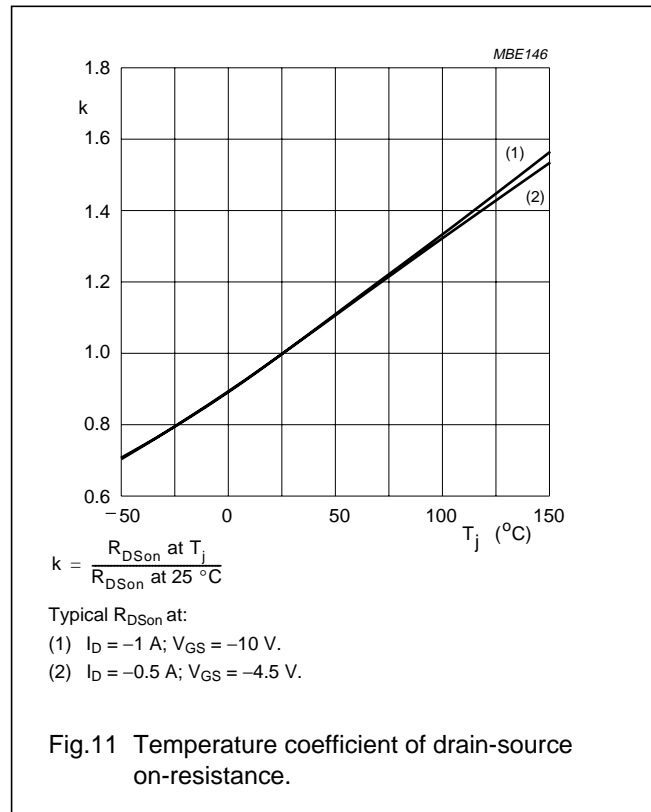
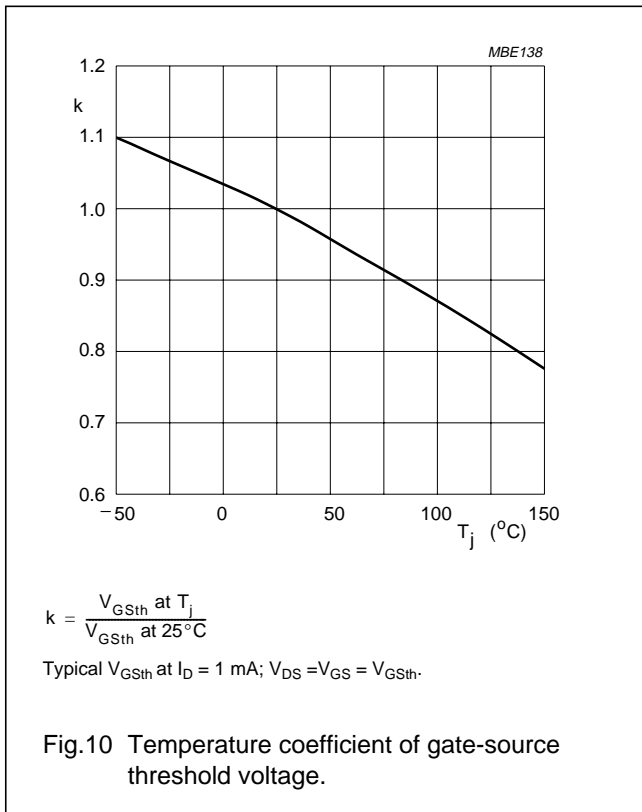
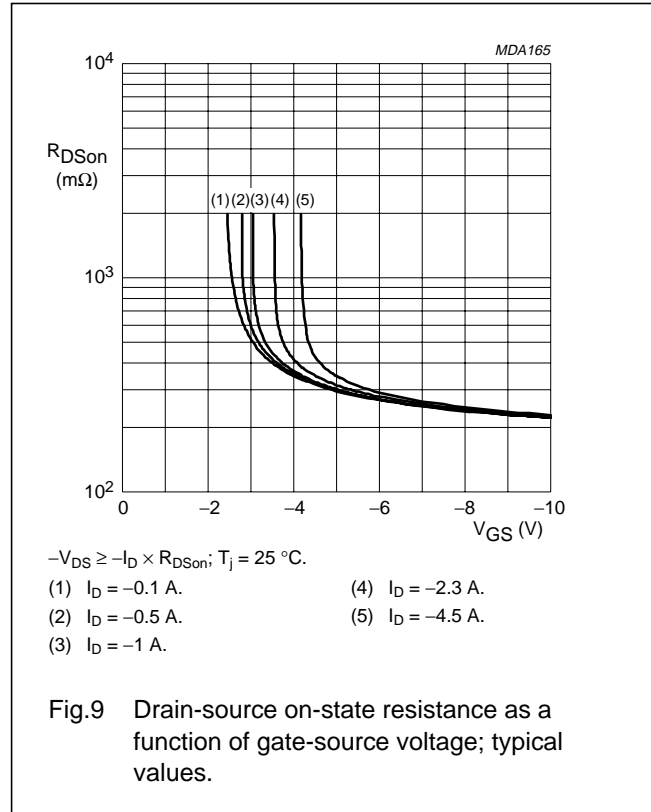
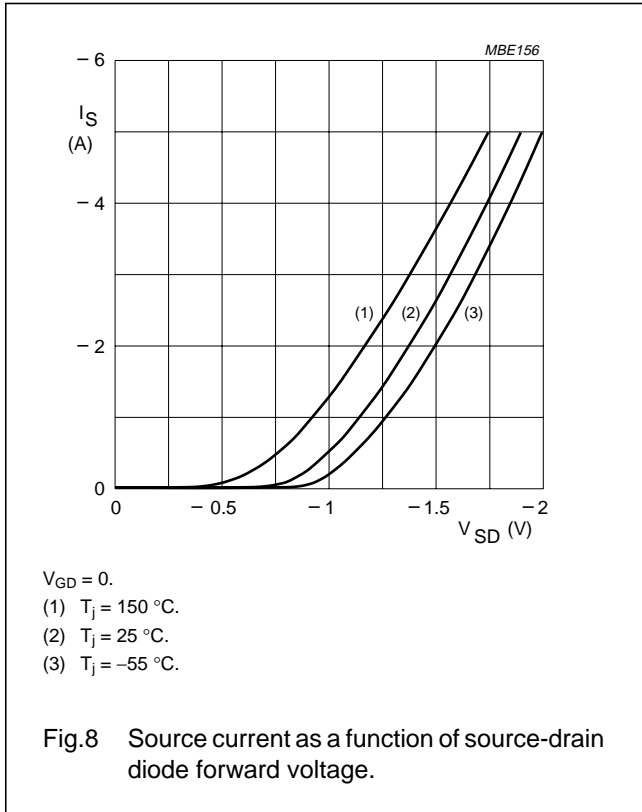
Dual P-channel enhancement mode MOS transistor

PHP225



Dual P-channel enhancement mode MOS transistor

PHP225



Dual P-channel enhancement mode MOS transistor

PHP225

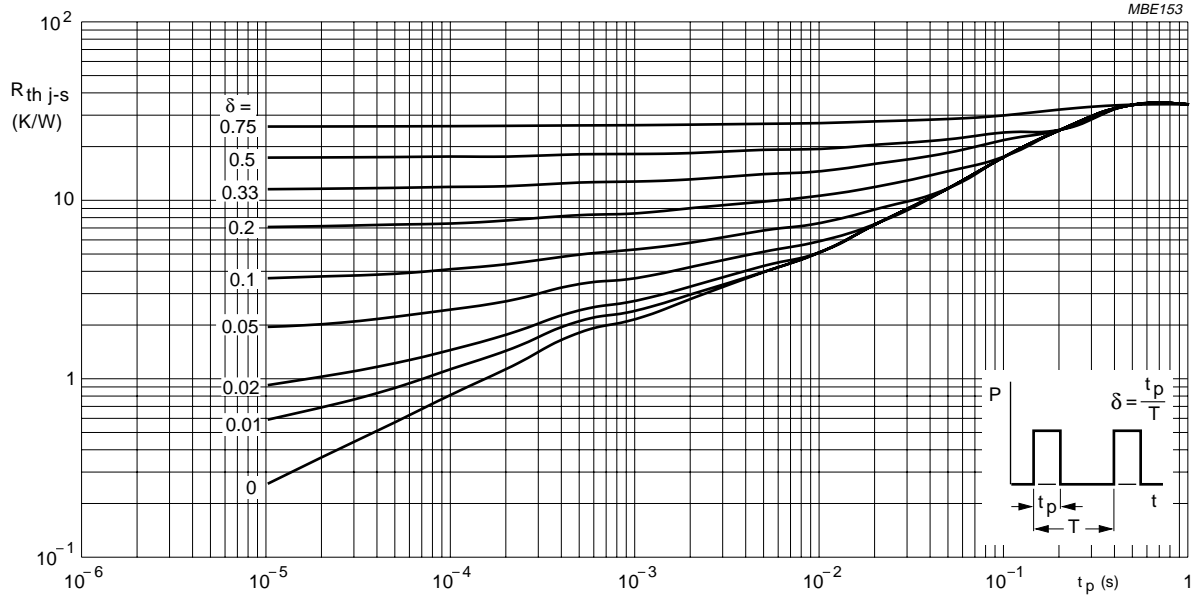


Fig.12 Transient thermal resistance from junction to soldering point as a function of pulse time; typical values.



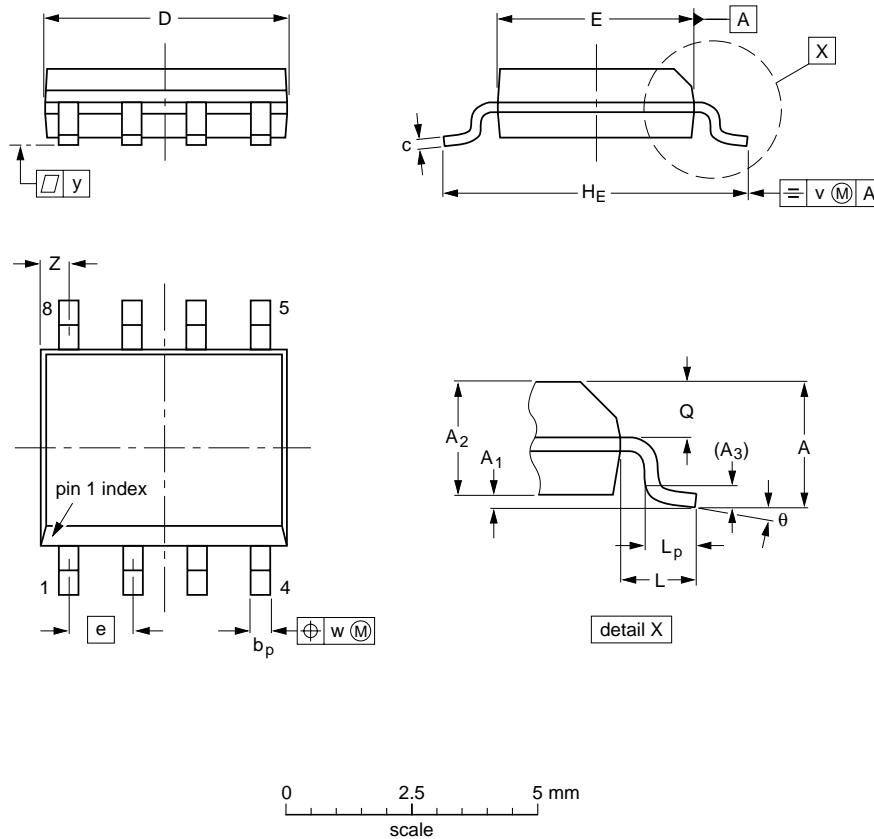
# Dual P-channel enhancement mode MOS transistor

PHP225

## PACKAGE OUTLINE

S08: plastic small outline package; 8 leads; body width 3.9 mm

SOT96-1



**DIMENSIONS (inch dimensions are derived from the original mm dimensions)**

UNIT	A <sub>max.</sub>	A <sub>1</sub>	A <sub>2</sub>	A <sub>3</sub>	b <sub>p</sub>	c	D <sup>(1)</sup>	E <sup>(2)</sup>	e	H <sub>E</sub>	L	L <sub>p</sub>	Q	v	w	y	z <sup>(1)</sup>	θ
mm	1.75	0.25 0.10	1.45 1.25	0.25	0.49 0.36	0.25 0.19	5.0 4.8	4.0 3.8	1.27	6.2 5.8	1.05	1.0 0.4	0.7 0.6	0.25	0.25	0.1	0.7 0.3	8° 0°
inches	0.069	0.010 0.004	0.057 0.049	0.01	0.019 0.014	0.0100 0.0075	0.20 0.19	0.16 0.15	0.050	0.244 0.228	0.041	0.039 0.016	0.028 0.024	0.01	0.01	0.004	0.028 0.012	

**Notes**

1. Plastic or metal protrusions of 0.15 mm maximum per side are not included.
2. Plastic or metal protrusions of 0.25 mm maximum per side are not included.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT96-1	076E03S	MS-012AA				95-02-04 97-05-22

## Dual P-channel enhancement mode MOS transistor

PHP225

### 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.	

### 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.

---

Dual P-channel enhancement  
mode MOS transistor

---

PHP225

**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 0044

**Finland:** Sinikalliontie 3, FIN-02630 ESPOO,  
Tel. +358 9 615800, Fax. +358 9 61580920

**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, PO Box 18053,  
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. +7 095 755 6918, Fax. +7 095 755 6919

**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 Semiconductors, 6F, No. 96, Chien Kuo N. Rd., Sec. 1,  
TAIPEI, Taiwan Tel. +886 2 2134 2865, Fax. +886 2 2134 2874

**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>

© Philips Electronics N.V. 1997

SCA54

All rights are reserved. Reproduction in whole or in part is prohibited without the prior written consent of the copyright owner.

The information presented in this document does not form part of any quotation or contract, is believed to be accurate and reliable and may be changed without notice. No liability will be accepted by the publisher for any consequence of its use. Publication thereof does not convey nor imply any license under patent- or other industrial or intellectual property rights.

Printed in The Netherlands

137107/00/02/pp12

Date of release: 1997 Jun 20

Document order number: 9397 750 02523

*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销世界各大品牌 IC 芯片和电子元器件的连锁经营综合性国际公司，专业经营进口、国产名厂名牌电子元件，型号、种类齐全。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。商斯达实业公司拥有庞大的资料库，有数位毕业于著名高校——有中国电子工业摇篮之称的西安电子科技大学（西军电）并长期从事国防尖端科技研究的高级工程师为您精挑细选、量身订做各种高科技电子元器件，并解决各种技术问题。

微波光电部专业代理经销高频、微波、光纤、光电元器件、组件、部件、模块、整机；电磁兼容元器件、材料、设备；微波 CAD、EDA 软件、开发测试仿真工具；微波、光纤仪器仪表。欢迎国外高科技微波、光纤厂商将优秀产品介绍到中国、共同开拓市场。长期大量现货专业批发高频、微波、卫星、光纤、电视、CATV 器件：晶振、VCO、连接器、PIN 开关、变容二极管、开关二极管、低噪晶体管、功率电阻及电容、放大器、功率管、MMIC、混频器、耦合器、功分器、振荡器、合成器、衰减器、滤波器、隔离器、环行器、移相器、调制解调器；光电子元件和组件：红外发射管、红外接收管、光电开关、光敏管、发光二极管和发光二极管组件、半导体激光二极管和激光器组件、光电探测器和光接收组件、光发射接收模块、光纤激光器和光放大器、光调制器、光开关、DWDM 用光发射和接收器件、用户接入系统光收发器件与模块、光纤连接器、光纤跳线/尾纤、光衰减器、光纤适配器、光隔离器、光耦合器、光环行器、光复用器/转换器；无线收发芯片和模组、蓝牙芯片和模组。

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/](http://www.rfoe.net/)

商斯达消费电子产品网：<http://www.icasic.com/>

商斯达实业科技产品网：<http://www.sunstars.cn/> 微波元器件销售热线：

地址：深圳市福田区福华路福庆街鸿图大厦 1602 室

电话：0755-82884100 83397033 83396822 83398585

传真：0755-83376182 (0) 13823648918 MSN: SUNS8888@hotmail.com

邮编：518033 E-mail:[szss20@163.com](mailto: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 号上海赛格电子市场 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