

# DATA SHEET

## **PSMN130-200D** N-channel TrenchMOS<sup>(TM)</sup> transistor

Product specification

August 1999

**SiliconMAX**

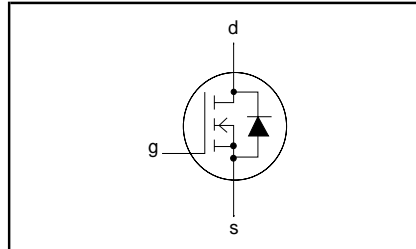
**N-channel TrenchMOS<sup>(TM)</sup> transistor**

**PSMN130-200D**

**FEATURES**

- 'Trench' technology
- Very low on-state resistance
- Fast switching
- Low thermal resistance

**SYMBOL**



**QUICK REFERENCE DATA**

$V_{DSS} = 200\text{ V}$
$I_D = 20\text{ A}$
$R_{DS(ON)} \leq 130\text{ m}\Omega$

**GENERAL DESCRIPTION**

SiliconMAX products use the latest Philips Trench technology to achieve the lowest possible on-state resistance in each package at each voltage rating.

**Applications:-**

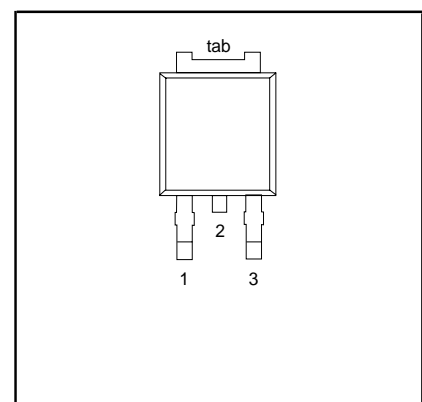
- d.c. to d.c. converters
- switched mode power supplies

The PSMN130-200D is supplied in the SOT428 (Dpak) surface mounting package.

**PINNING**

PIN	DESCRIPTION
1	gate
2	drain <sup>1</sup>
3	source
tab	drain

**SOT428 (DPAK)**



**LIMITING VALUES**

Limiting values in accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
$V_{DSS}$	Drain-source voltage	$T_j = 25\text{ }^\circ\text{C}$ to $175\text{ }^\circ\text{C}$	-	200	V
$V_{DGR}$	Drain-gate voltage	$T_j = 25\text{ }^\circ\text{C}$ to $175\text{ }^\circ\text{C}$ ; $R_{GS} = 20\text{ k}\Omega$	-	200	V
$V_{GS}$	Gate-source voltage		-	$\pm 20$	V
$I_D$	Continuous drain current	$T_{mb} = 25\text{ }^\circ\text{C}$ ; $V_{GS} = 10\text{ V}$	-	20	A
		$T_{mb} = 100\text{ }^\circ\text{C}$ ; $V_{GS} = 10\text{ V}$	-	14	A
$I_{DM}$	Pulsed drain current	$T_{mb} = 25\text{ }^\circ\text{C}$	-	80	A
$P_D$	Total power dissipation	$T_{mb} = 25\text{ }^\circ\text{C}$	-	150	W
$T_j, T_{stg}$	Operating junction and storage temperature		-55	175	$^\circ\text{C}$

<sup>1</sup> It is not possible to make connection to pin 2 of the SOT428 package.

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**AVALANCHE ENERGY LIMITING VALUES**

Limiting values in accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
$E_{AS}$	Non-repetitive avalanche energy	Unclamped inductive load, $I_{AS} = 19$ A; $t_p = 100$ $\mu$ s; $T_j$ prior to avalanche = 25°C; $V_{DD} \leq 25$ V; $R_{GS} = 50$ $\Omega$ ; $V_{GS} = 10$ V; refer to fig;15	-	252	mJ
$I_{AS}$	Non-repetitive avalanche current		-	20	A

**THERMAL RESISTANCES**

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$R_{th\ j-mb}$	Thermal resistance junction to mounting base		-	-	1	K/W
$R_{th\ j-a}$	Thermal resistance junction to ambient	SOT428 package, pcb mounted, minimum footprint	-	50	-	K/W

**ELECTRICAL CHARACTERISTICS** $T_j = 25^\circ\text{C}$  unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	$V_{GS} = 0$ V; $I_D = 0.25$ mA; $T_j = -55^\circ\text{C}$	200 178	- -	- -	V V
$V_{GS(TO)}$	Gate threshold voltage	$V_{DS} = V_{GS}$ ; $I_D = 1$ mA $T_j = 175^\circ\text{C}$ $T_j = -55^\circ\text{C}$	2 1 -	3 - -	4 - 6	V V V
$R_{DS(ON)}$	Drain-source on-state resistance	$V_{GS} = 10$ V; $I_D = 25$ A $T_j = 175^\circ\text{C}$	- -	120 -	130 377	m $\Omega$ m $\Omega$
$I_{GSS}$	Gate source leakage current	$V_{GS} = \pm 10$ V; $V_{DS} = 0$ V	-	0.02	100	nA
$I_{DSS}$	Zero gate voltage drain current	$V_{DS} = 150$ V; $V_{GS} = 0$ V; $T_j = 175^\circ\text{C}$	-	0.05	10 500	$\mu$ A $\mu$ A
$Q_{g(tot)}$	Total gate charge	$I_D = 20$ A; $V_{DD} = 160$ V; $V_{GS} = 10$ V	-	65	-	nC
$Q_{gs}$	Gate-source charge		-	10	-	nC
$Q_{gd}$	Gate-drain (Miller) charge		-	22	-	nC
$t_{d\ on}$	Turn-on delay time	$V_{DD} = 100$ V; $R_D = 4.7$ $\Omega$ ;	-	15	-	ns
$t_r$	Turn-on rise time	$V_{GS} = 10$ V; $R_G = 5.6$ $\Omega$	-	46	-	ns
$t_{d\ off}$	Turn-off delay time	Resistive load	-	50	-	ns
$t_f$	Turn-off fall time		-	38	-	ns
$L_d$	Internal drain inductance	Measured tab to centre of die	-	3.5	-	nH
$L_s$	Internal source inductance	Measured from source lead to source bond pad	-	7.5	-	nH
$C_{iss}$	Input capacitance	$V_{GS} = 0$ V; $V_{DS} = 25$ V; $f = 1$ MHz	-	2470	-	pF
$C_{oss}$	Output capacitance		-	207	-	pF
$C_{fss}$	Feedback capacitance		-	90	-	pF

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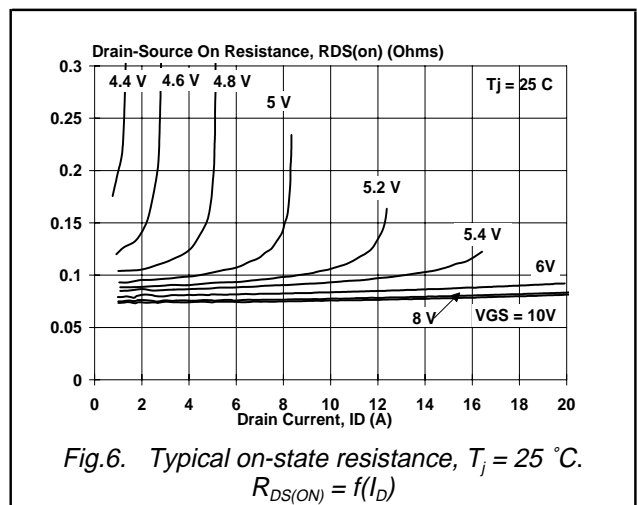
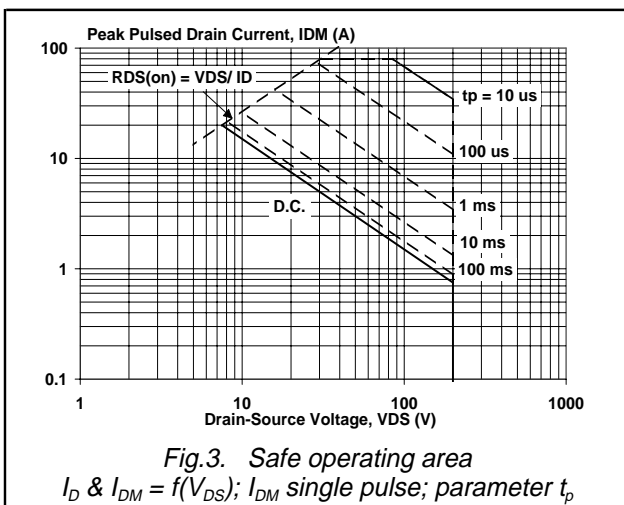
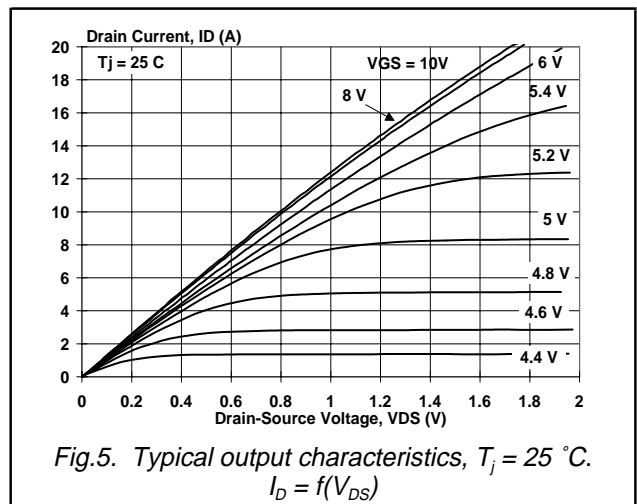
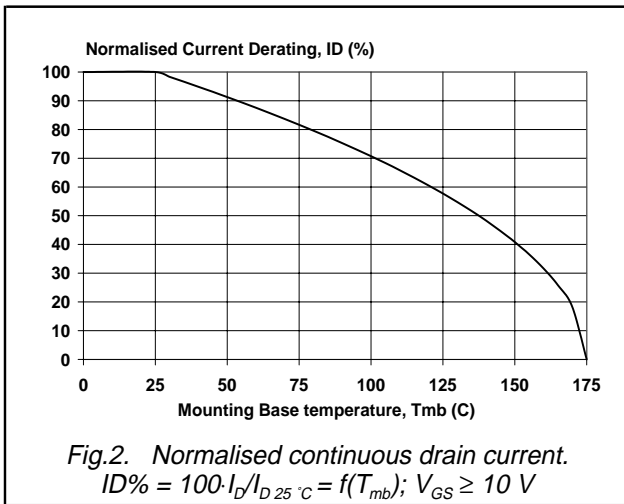
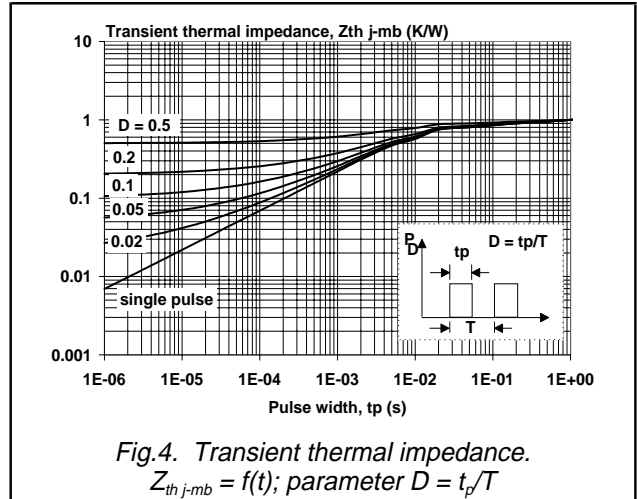
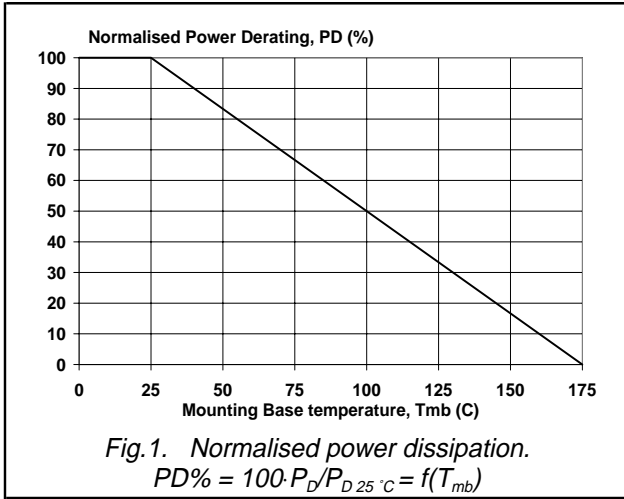
**REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS** $T_j = 25^\circ\text{C}$  unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$I_S$	Continuous source current (body diode)		-	-	20	A
$I_{SM}$	Pulsed source current (body diode)		-	-	80	A
$V_{SD}$	Diode forward voltage	$I_F = 25\text{ A}; V_{GS} = 0\text{ V}$	-	0.95	1.2	V
$t_{rr}$	Reverse recovery time	$I_F = 20\text{ A}; -di_F/dt = 100\text{ A}/\mu\text{s};$ $V_{GS} = -10\text{ V}; V_R = 25\text{ V}$	-	124	-	ns
$Q_{rr}$	Reverse recovery charge		-	0.74	-	$\mu\text{C}$

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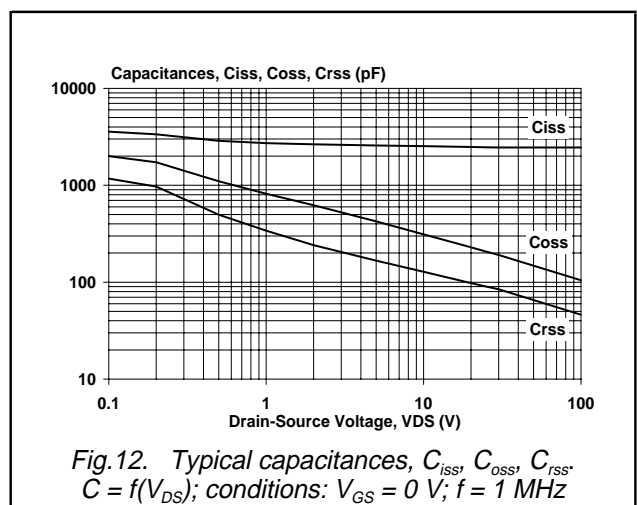
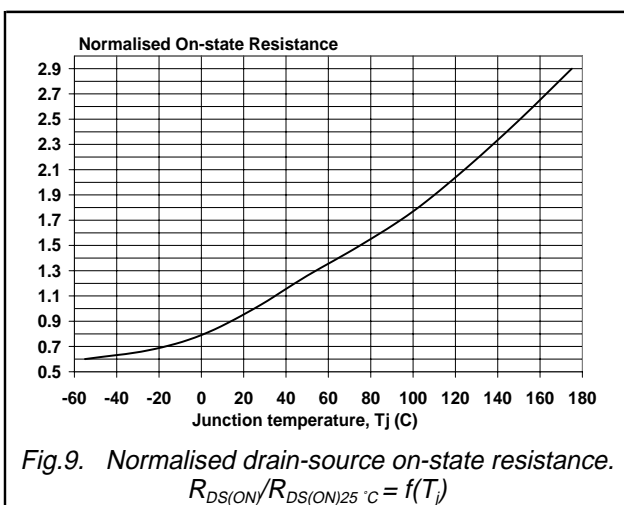
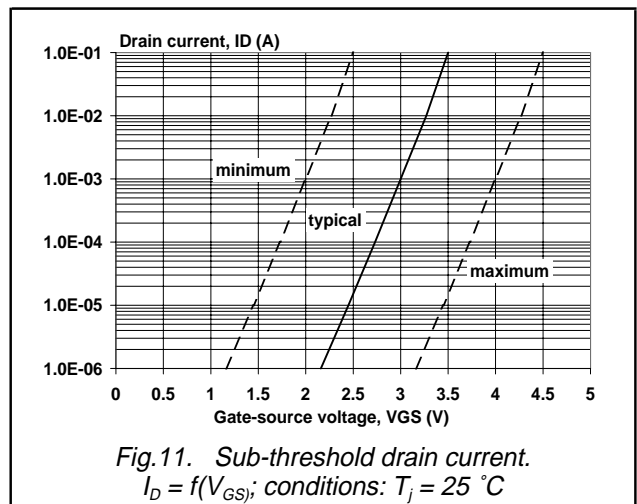
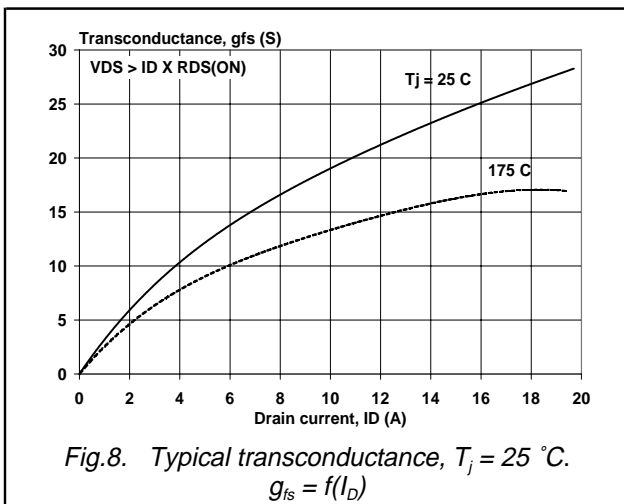
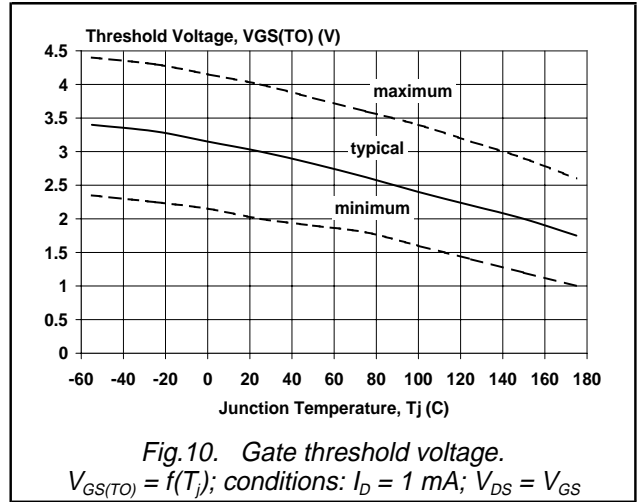
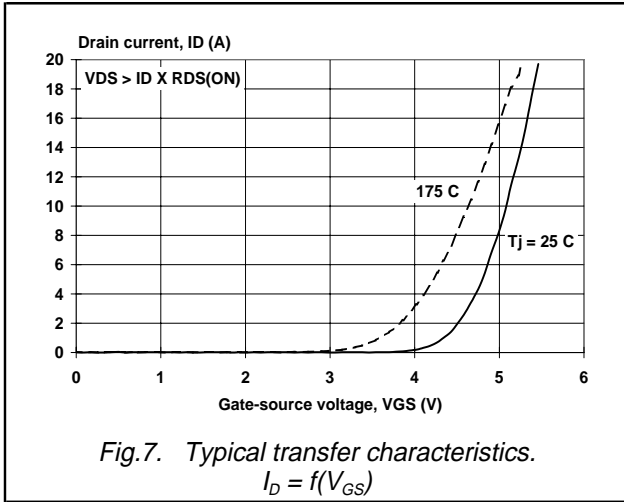
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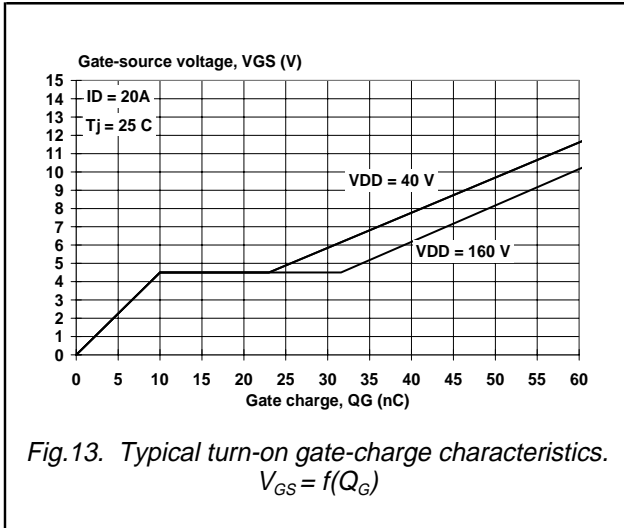


Fig. 13. Typical turn-on gate-charge characteristics.  
 $V_{GS} = f(Q_G)$

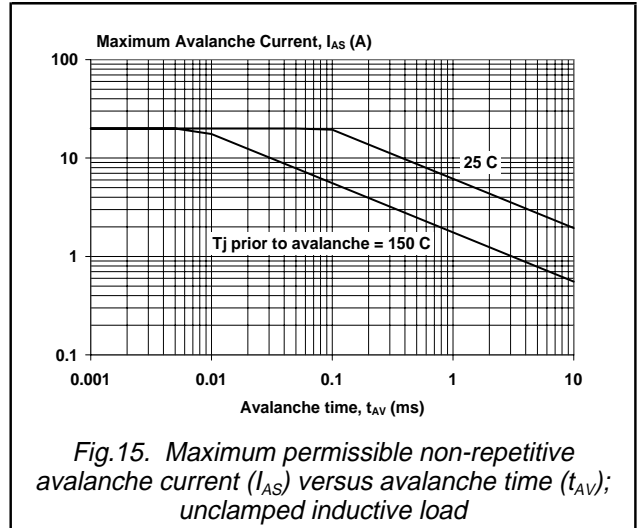


Fig. 15. Maximum permissible non-repetitive avalanche current ( $I_{AS}$ ) versus avalanche time ( $t_{AV}$ ); unclamped inductive load

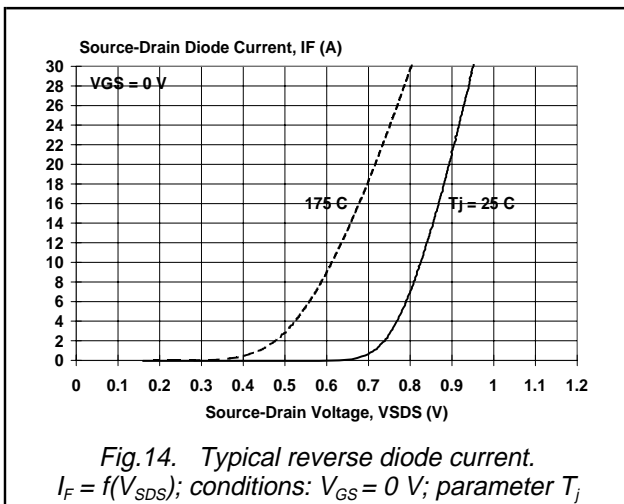


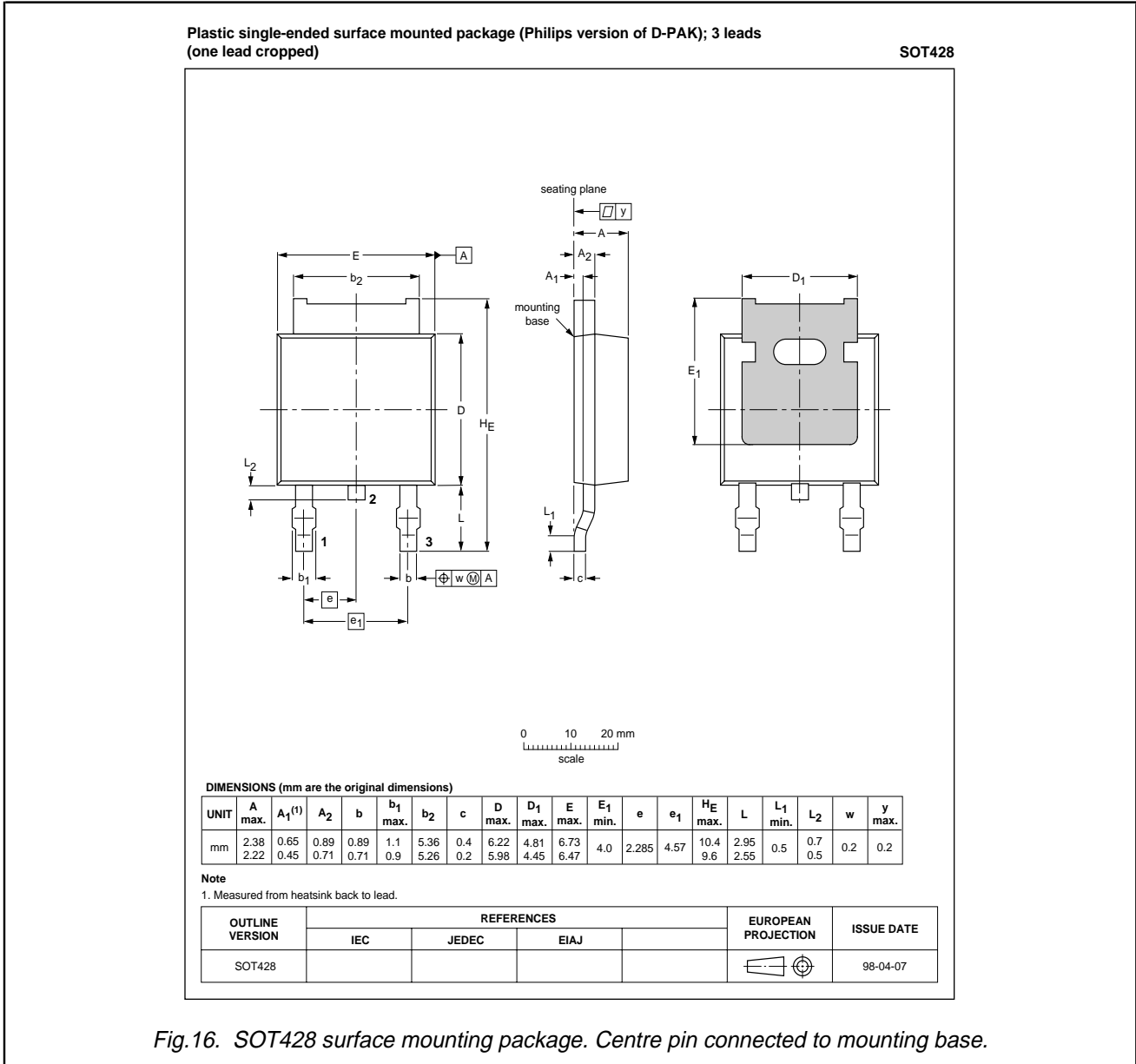
Fig. 14. Typical reverse diode current.  
 $I_F = f(V_{SDS})$ ; conditions:  $V_{GS} = 0 V$ ; parameter  $T_j$



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MECHANICAL DATA



**Notes**

1. This product is supplied in anti-static packaging. The gate-source input must be protected against static discharge during transport or handling.
2. Refer to SMD Footprint Design and Soldering Guidelines, Data Handbook SC18.
3. Epoxy meets UL94 V0 at 1/8".

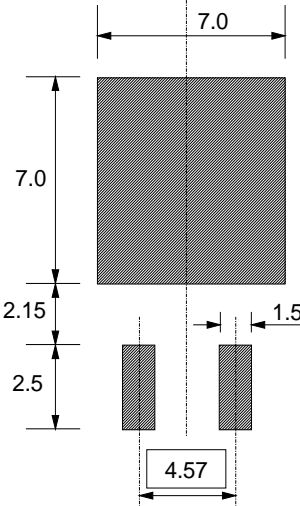


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**MOUNTING INSTRUCTIONS**

*Dimensions in mm*



*Fig.17. SOT428 : soldering pattern for surface mounting.*

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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 are given 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 this 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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# Philips Semiconductors – a worldwide company

**Argentina:** see South America

**Australia:** 3 Figtree Drive, HOMEBUSH, NSW 2140,  
Tel. +61 2 9704 8141, Fax. +61 2 9704 8139

**Austria:** Computerstr. 6, A-1101 WIEN, P.O. Box 213,  
Tel. +43 1 60 101 1248, Fax. +43 1 60 101 1210

**Belarus:** Hotel Minsk Business Center, Bld. 3, r. 1211, Volodarski Str. 6,  
220050 MINSK, Tel. +375 172 20 0733, Fax. +375 172 20 0773

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51 James Bourchier Blvd., 1407 SOFIA,  
Tel. +359 2 68 9211, Fax. +359 2 68 9102

**Canada:** PHILIPS SEMICONDUCTORS/COMPONENTS,  
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**China/Hong Kong:** 501 Hong Kong Industrial Technology Centre,  
72 Tat Chee Avenue, Kowloon Tong, HONG KONG,  
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**Colombia:** see South America

**Czech Republic:** see Austria

**Denmark:** Sydhavnsgade 23, 1780 COPENHAGEN V,  
Tel. +45 33 29 3333, Fax. +45 33 29 3905

**Finland:** Sinikalliontie 3, FIN-02630 ESPOO,  
Tel. +358 9 615 800, Fax. +358 9 6158 0920

**France:** 51 Rue Carnot, BP317, 92156 SURESNES Cedex,  
Tel. +33 1 4099 6161, Fax. +33 1 4099 6427

**Germany:** Hammerbrookstraße 69, D-20097 HAMBURG,  
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**Hungary:** see Austria

**India:** Philips INDIA Ltd, Band Box Building, 2nd floor,  
254-D, Dr. Annie Besant Road, Worli, MUMBAI 400 025,  
Tel. +91 22 493 8541, Fax. +91 22 493 0966

**Indonesia:** PT Philips Development Corporation, Semiconductors Division,  
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**Israel:** RAPAC Electronics, 7 Kehilat Saloniki St, PO Box 18053,  
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**Italy:** PHILIPS SEMICONDUCTORS, Via Casati, 23 - 20052 MONZA (MI),  
Tel. +39 039 203 6838, Fax +39 039 203 6800

**Japan:** Philips Bldg 13-37, Kohnan 2-chome, Minato-ku,  
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**Malaysia:** No. 76 Jalan Universiti, 46200 PETALING JAYA, SELANGOR,  
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**Mexico:** 5900 Gateway East, Suite 200, EL PASO, TEXAS 79905,  
Tel. +9-5 800 234 7381, Fax +9-5 800 943 0087

**Middle East:** see Italy

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**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,  
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**Pakistan:** see Singapore

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Metro MANILA, Tel. +63 2 816 6380, Fax. +63 2 817 3474

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**Portugal:** see Spain

**Romania:** see Italy

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**South America:** Al. Vicente Pinzon, 173, 6th floor,  
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**Spain:** Balmes 22, 08007 BARCELONA,  
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**Sweden:** Kottbygatan 7, Akalla, S-16485 STOCKHOLM,  
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**Turkey:** Yukari Dudullu, Org. San. Blg., 2.Cad. Nr. 28 81260 Umraniye,  
ISTANBUL, Tel. +90 216 522 1500, Fax. +90 216 522 1813

**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. +44 208 730 5000, Fax. +44 208 754 8421

**United States:** 811 East Arques Avenue, SUNNYVALE, CA 94088-3409,  
Tel. +1 800 234 7381, Fax. +1 800 943 0087

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