

PMWD20XN

Dual N-channel μTrenchMOS™ extremely low level FET

Rev. 02 — 26 April 2005 Product data sheet

1. Product profile

1.1 General description

Dual common drain N-channel enhancement mode Field-Effect Transistor (FET) in a plastic package using TrenchMOS™ technology.

1.2 Features

- Surface-mounted package
- Low profile
- Extremely low threshold voltage
- Fast switching

1.3 Applications

- Portable appliances
- Battery management

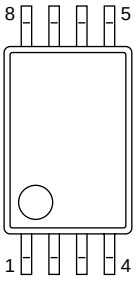
1.4 Quick reference data

- $V_{DS} \leq 20$ V
- $I_D \leq 10.4$ A
- $P_{tot} \leq 4.2$ W
- $R_{DSon} \leq 24$ mΩ

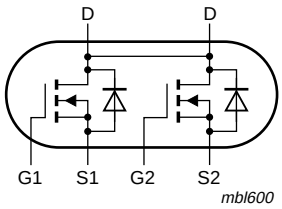
2. Pinning information

Table 1: Pinning

Pin	Description	Simplified outline	Symbol
1, 8	drain (D)		
2, 3	source1 (S1)		
4	gate1 (G1)		
5	gate2 (G2)		
6, 7	source2 (S2)		



SOT530-1 (TSSOP8)



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3. Ordering information

Table 2: Ordering information

Type number	Package		
	Name	Description	Version
PMWD20XN	TSSOP8	plastic thin shrink small outline package; 8 leads; body width 4.4 mm	SOT530-1

4. Limiting values

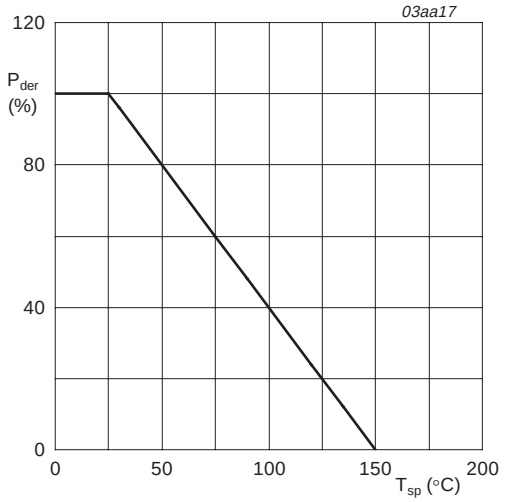
Table 3: Limiting values

In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions		Min	Max	Unit
V_{DS}	drain-source voltage (DC)	25 °C ≤ T_j ≤ 150 °C		-	20	V
V_{DGR}	drain-gate voltage (DC)	25 °C ≤ T_j ≤ 150 °C; R_{GS} = 20 kΩ		-	20	V
V_{GS}	gate-source voltage (DC)			-	±12	V
I_D	drain current (DC)	T_{sp} = 25 °C; V_{GS} = 4.5 V; Figure 2 and 3	[1]	-	10.4	A
		T_{sp} = 100 °C; V_{GS} = 4.5 V; Figure 2	[1]	-	6.5	A
I_{DM}	peak drain current	T_{sp} = 25 °C; pulsed; t_p ≤ 10 μs; Figure 3	[1]	-	41.7	A
P_{tot}	total power dissipation	T_{sp} = 25 °C; Figure 1	[1]	-	4.2	W
T_{stg}	storage temperature			–55	+150	°C
T_j	junction temperature			–55	+150	°C
Source-drain diode						
I_S	source (diode forward) current (DC)	T_{sp} = 25 °C	[1]	-	3.5	A
I_{SM}	peak source (diode forward) current	T_{sp} = 25 °C; pulsed; t_p ≤ 10 μs	[1]	-	14	A

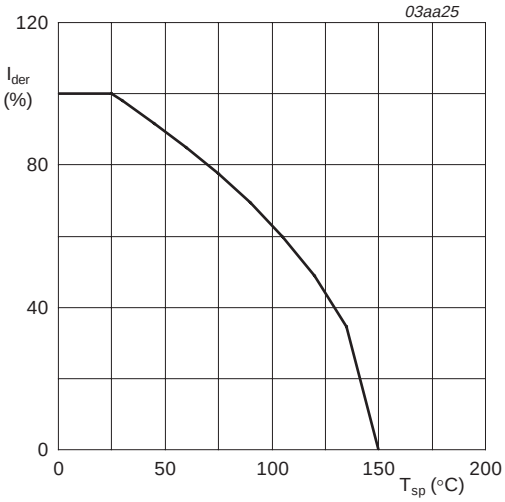
[1] Single device conducting.

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$$P_{der} = \frac{P_{tot}}{P_{tot(25\ ^\circ C)}} \times 100\ \%$$

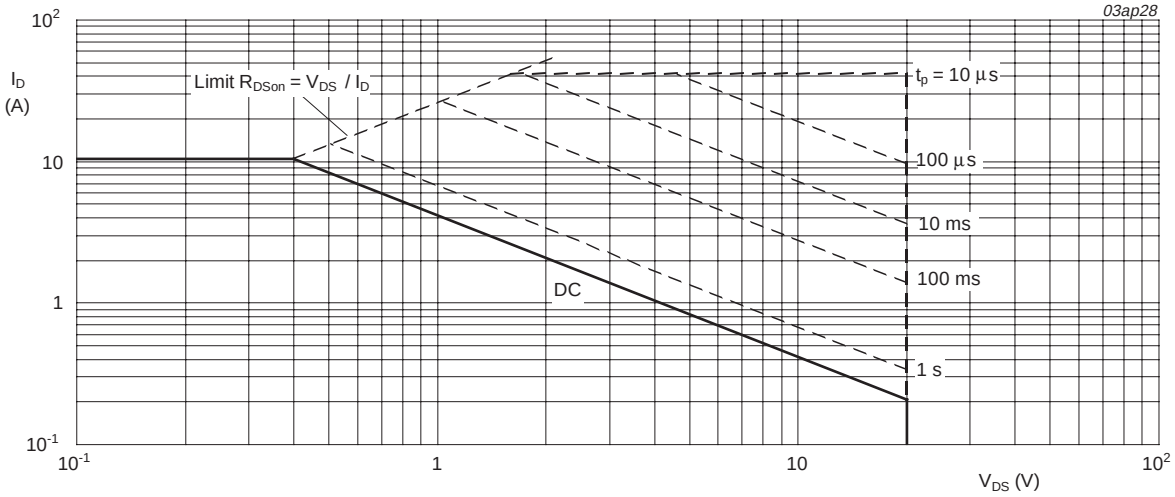
Fig 1. Normalized total power dissipation as a function of solder point temperature



$V_{GS} \geq 4.5$ V

$$I_{der} = \frac{I_D}{I_{D(25\ ^\circ C)}} \times 100\ \%$$

Fig 2. Normalized continuous drain current as a function of solder point temperature



T_{sp} = 25 °C; I_{DM} is single pulse

Fig 3. Safe operating area; continuous and peak drain currents as a function of drain-source voltage

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5. Thermal characteristics

Table 4: Thermal characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$R_{th(j-sp)}$	thermal resistance from junction to solder point	Figure 4	-	-	30	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient	mounted on a printed-circuit board; minimum footprint; vertical in still air	-	100	-	K/W

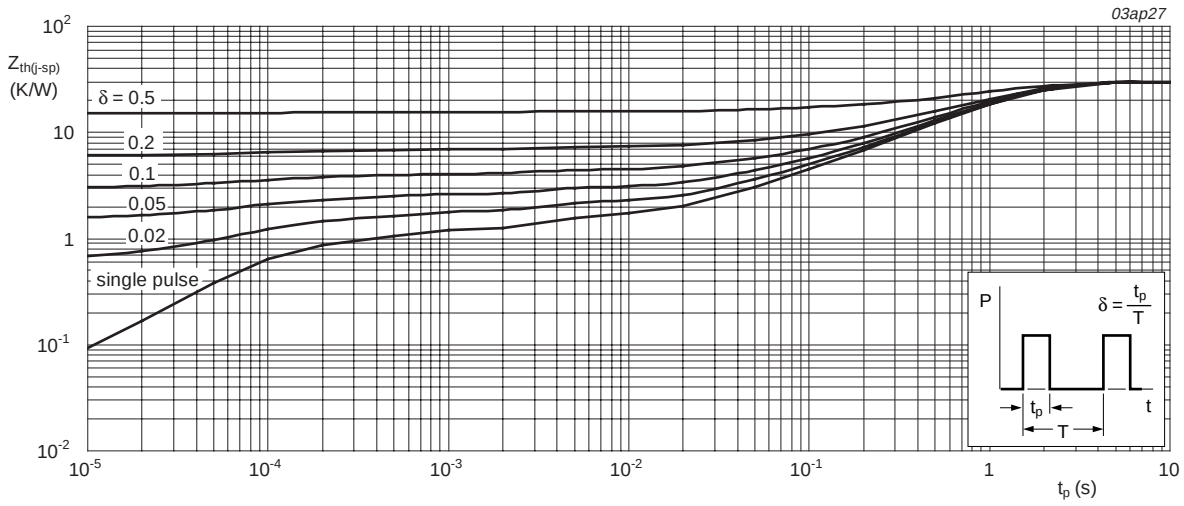


Fig 4. Transient thermal impedance from junction to solder point as a function of pulse duration

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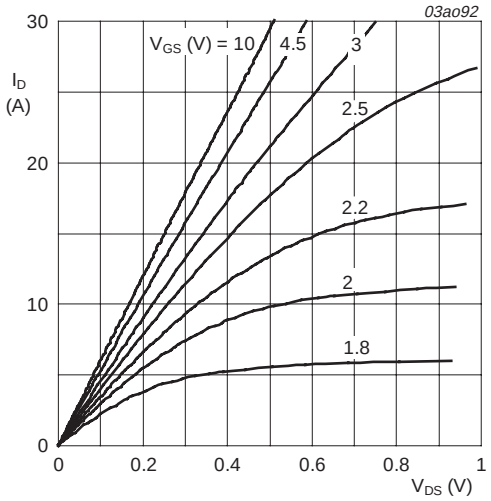
6. Characteristics

Table 5: Characteristics

T_j = 25 °C unless otherwise specified.

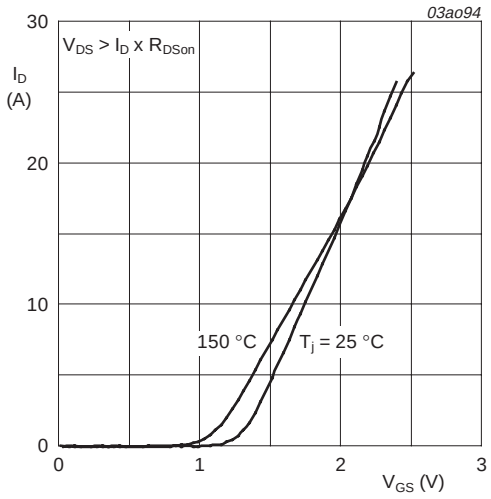
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static characteristics						
$V_{(BR)DSS}$	drain-source breakdown voltage	I_D = 250 μA; V_{GS} = 0 V				
		T_j = 25 °C	20	-	-	V
		T_j = −55 °C	18	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	I_D = 1 mA; V_{DS} = V_{GS}; Figure 9 and 10	0.5	-	1.5	V
I_{DSS}	drain-source leakage current	V_{DS} = 20 V; V_{GS} = 0 V				
		T_j = 25 °C	-	-	1	μA
		T_j = 150 °C	-	-	100	μA
I_{GSS}	gate-source leakage current	V_{GS} = ±12 V; V_{DS} = 0 V	-	-	100	nA
R_{DSon}	drain-source on-state resistance	V_{GS} = 4.5 V; I_D = 4 A; Figure 7 and 8				
		T_j = 25 °C	-	20	24	mΩ
		T_j = 150 °C	-	32	38.4	mΩ
		V_{GS} = 2.5 V; I_D = 3 A; Figure 7 and 8	-	27	34	mΩ
		V_{GS} = 10 V; I_D = 4.2 A; Figure 7 and 8	-	18	22	mΩ
Dynamic characteristics						
$Q_{g(tot)}$	total gate charge	I_D = 4 A; V_{DS} = 10 V; V_{GS} = 4.5 V; Figure 13	-	11.6	-	nC
Q_{gs}	gate-source charge		-	1.8	-	nC
Q_{gd}	gate-drain (Miller) charge		-	3.7	-	nC
C_{iss}	input capacitance	V_{GS} = 0 V; V_{DS} = 16 V; f = 1 MHz; Figure 11	-	740	-	pF
C_{oss}	output capacitance		-	200	-	pF
C_{rss}	reverse transfer capacitance		-	135	-	pF
$t_{d(on)}$	turn-on delay time	V_{DS} = 10 V; R_L = 10 Ω; V_{GS} = 4.5 V; R_G = 6 Ω	-	21	-	ns
t_r	rise time		-	31	-	ns
$t_{d(off)}$	turn-off delay time		-	44	-	ns
t_f	fall time		-	30	-	ns
Source-drain diode						
V_{SD}	source-drain (diode forward) voltage	I_S = 5 A; V_{GS} = 0 V; Figure 12	-	0.8	1.2	V

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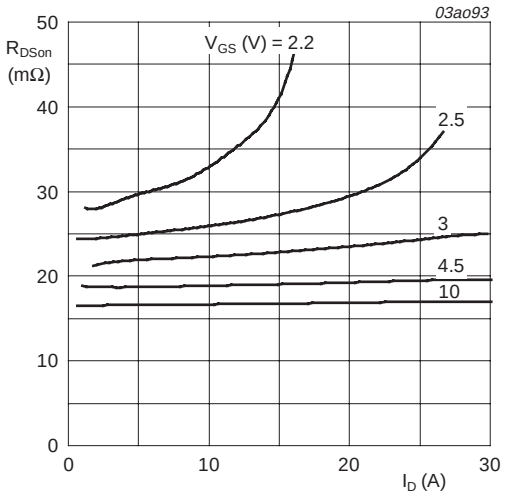
T_j = 25 °C

Fig 5. Output characteristics: drain current as a function of drain-source voltage; typical values



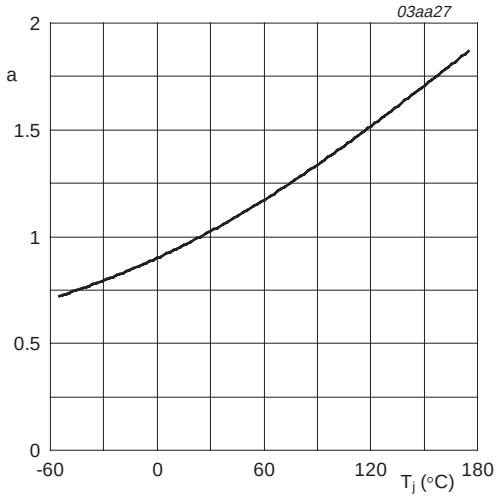
T_j = 25 °C and 150 °C; $V_{DS} > I_D \times R_{DSon}$

Fig 6. Transfer characteristics: drain current as a function of gate-source voltage; typical values



T_j = 25 °C

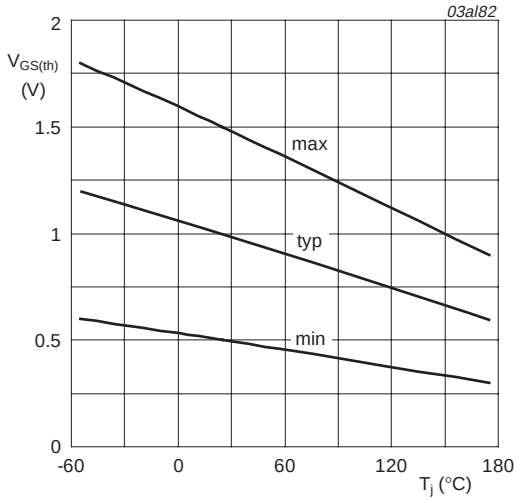
Fig 7. Drain-source on-state resistance as a function of drain current; typical values



$$a = \frac{R_{DSon}}{R_{DSon(25\ ^\circ C)}}$$

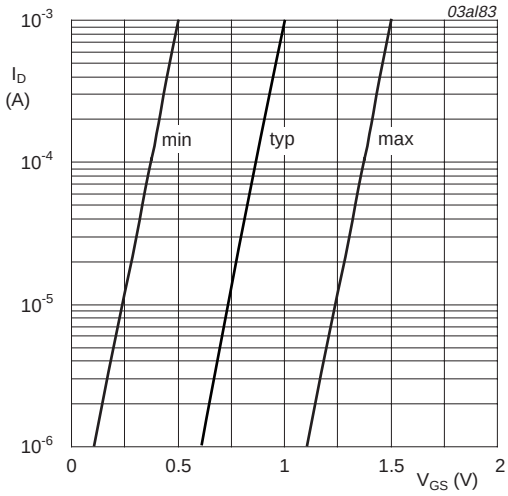
Fig 8. Normalized drain-source on-state resistance factor as a function of junction temperature

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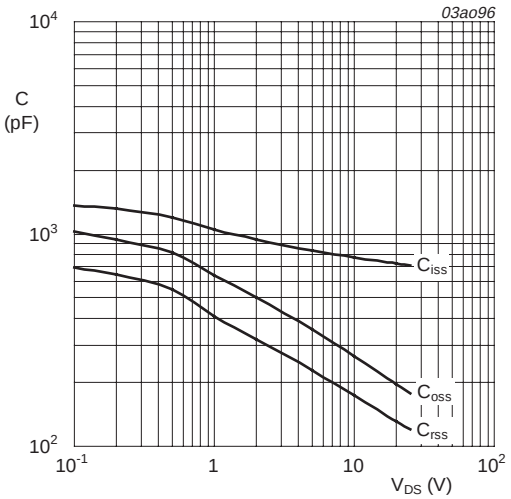
I_D = 1 mA; V_{DS} = V_{GS}

Fig 9. Gate-source threshold voltage as a function of junction temperature



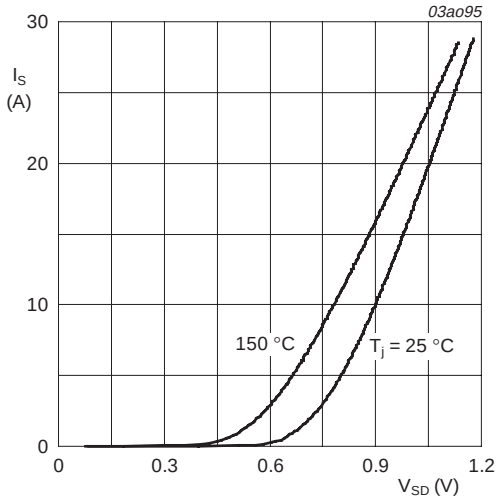
T_j = 25 °C; V_{DS} = 5 V

Fig 10. Sub-threshold drain current as a function of gate-source voltage



V_{GS} = 0 V; f = 1 MHz

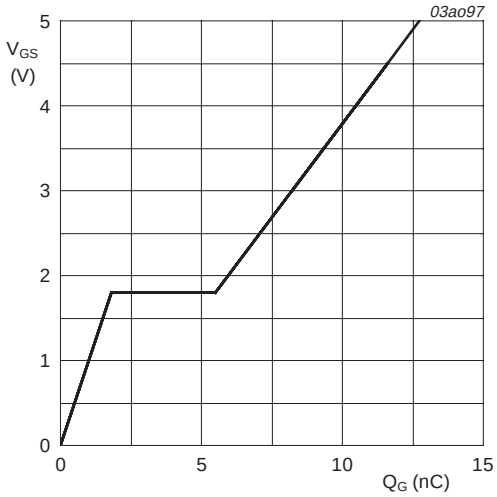
Fig 11. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values



T_j = 25 °C and 150 °C; V_{GS} = 0 V

Fig 12. Source (diode forward) current as a function of source-drain (diode forward) voltage; typical values

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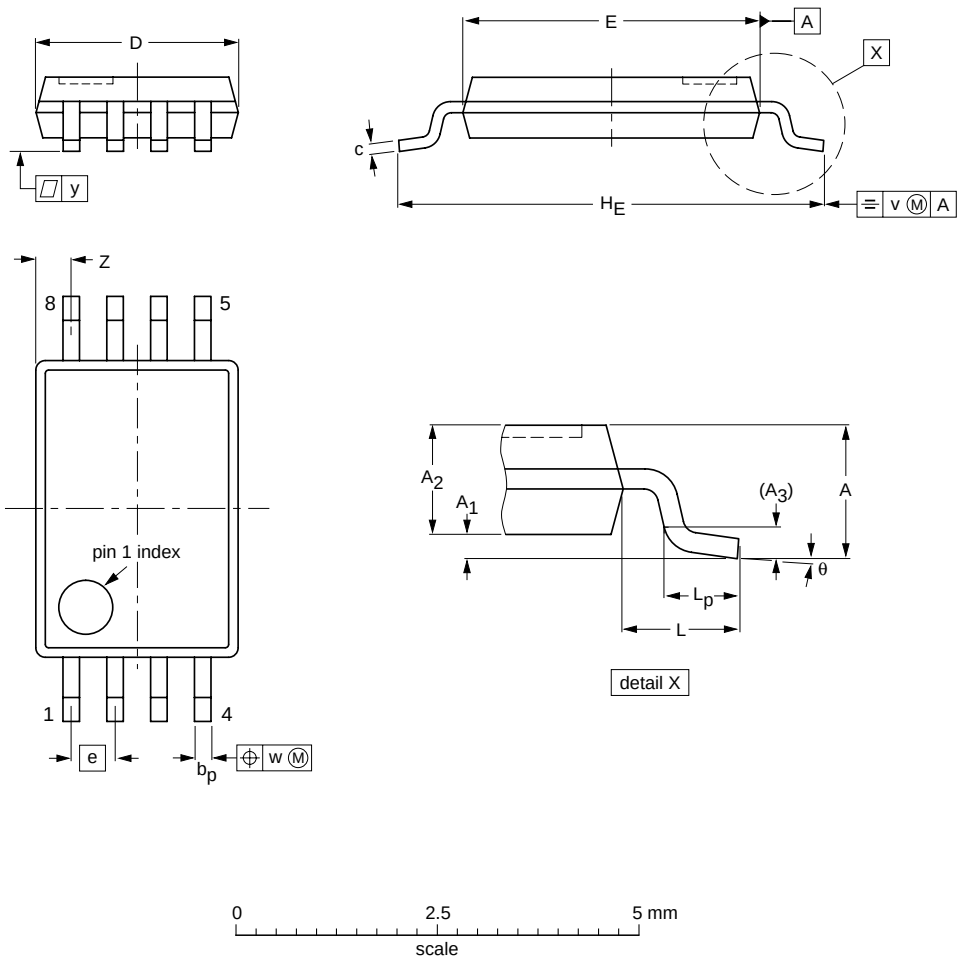
I_D = 4 A; V_{DD} = 10 V

Fig 13. Gate-source voltage as a function of gate charge; typical values

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7. Package outline

TSSOP8: plastic thin shrink small outline package; 8 leads; body width 4.4 mm **SOT530-1**



DIMENSIONS (mm are the original dimensions)

UNIT	A max.	A_1	A_2	A_3	b_p	c	$D^{(1)}$	$E^{(2)}$	e	H_E	L	L_p	v	w	y	$Z^{(1)}$	θ
mm	1.1	0.15 0.05	0.95 0.85	0.25	0.30 0.19	0.20 0.13	3.1 2.9	4.5 4.3	0.65	6.5 6.3	0.94	0.7 0.5	0.1	0.1	0.1	0.70 0.35	8° 0°

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	JEITA			
SOT530-1		MO-153				~~00-02-24~~ 03-02-18

Fig 14. Package outline SOT530-1 (TSSOP8)

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8. Revision history

Table 6: Revision history

Document ID	Release date	Data sheet status	Change notice	Doc. number	Supersedes
PMWD20XN_2	20050426	Product data sheet	-	9397 750 14721	PMWD20XN-01
Modifications:	• The format of this data sheet has been redesigned to comply with the new presentation and information standard of Philips Semiconductors. • I_D and P_{tot} data revised in Section 1.4 “Quick reference data”. • I_D, I_{DM}, P_{tot}, I_S and I_{SM} data revised in Table 3 “Limiting values”. • Figure 3 revised in Section 4 “Limiting values”. • $R_{th(j-sp)}$ data revised in Table 4 “Thermal characteristics”. • Figure 4 revised in Section 5 “Thermal characteristics”.				
PMWD20XN-01	20040119	Product data	-	9397 750 12595	-

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9. Data sheet status

Level	Data sheet status [1]	Product status [2] [3]	Definition
I	Objective data	Development	This data sheet contains data from the objective specification for product development. Philips Semiconductors reserves the right to change the specification in any manner without notice.
II	Preliminary data	Qualification	This data sheet contains data from the preliminary specification. Supplementary data will be published at a later date. Philips Semiconductors reserves the right to change the specification without notice, in order to improve the design and supply the best possible product.
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[1] Please consult the most recently issued data sheet before initiating or completing a design.

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[3] For data sheets describing multiple type numbers, the highest-level product status determines the data sheet status.

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Limiting values definition — Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 60134). 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.

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14. Contents

1	**Product profile**	**1**
1.1	General description	1
1.2	Features	1
1.3	Applications	1
1.4	Quick reference data	1
2	**Pinning information**	**1**
3	**Ordering information**	**2**
4	**Limiting values**	**2**
5	**Thermal characteristics**	**4**
6	**Characteristics**	**5**
7	**Package outline**	**9**
8	**Revision history**	**10**
9	**Data sheet status**	**11**
10	**Definitions**	**11**
11	**Disclaimers**	**11**
12	**Trademarks**	**11**
13	**Contact information**	**11**

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