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## **PSMN025-100D**



# N-channel TrenchMOS SiliconMAX standard level FET Rev. 4 — 12 January 2012 Product d

**Product data sheet** 

#### **Product profile** 1.

#### 1.1 General description

SiliconMAX standard level N-channel enhancement mode Field-Effect Transistor (FET) in a plastic package using TrenchMOS technology. This product is designed and qualified for use in computing, communications, consumer and industrial applications only.

#### 1.2 Features and benefits

- Higher operating power due to low thermal resistance
- Low conduction losses due to low on-state resistance
- Suitable for high frequency applications due to fast switching characteristics

#### 1.3 Applications

DC-to-DC converters

Switched-mode power supplies

#### 1.4 Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Тур	Max	Unit
$V_{DS}$	drain-source voltage	T <sub>j</sub> ≥ 25 °C; T <sub>j</sub> ≤ 175 °C	-	-	100	V
I <sub>D</sub>	drain current	$T_{mb}$ = 25 °C; $V_{GS}$ = 10 V; see <u>Figure 1</u> ; see <u>Figure 4</u>	-	-	47	Α
P <sub>tot</sub>	total power dissipation	T <sub>mb</sub> = 25 °C; see <u>Figure 2</u>	-	-	150	W
Static char	acteristics					
R <sub>DSon</sub>	drain-source on-state resistance	$V_{GS}$ = 10 V; $I_D$ = 25 A; $T_j$ = 25 °C; see <u>Figure 11</u> ; see <u>Figure 12</u>	-	22	25	mΩ
Dynamic cl	haracteristics					
$Q_{GD}$	gate-drain charge	$V_{GS} = 10 \text{ V}; I_D = 45 \text{ A}; V_{DS} = 80 \text{ V};$ $T_j = 25 \text{ °C}; \text{ see } \frac{\text{Figure } 13}{\text{ V}}$	-	25	-	nC



## 2. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	G	gate		_
2	D	drain[1]	mb	D
3	S	source		
mb	D	mounting base; connected to drain	1 3	mbb076 S
			SOT428 (DPAK)	

<sup>[1]</sup> It is not possible to make connection to pin 2.

## 3. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PSMN025-100D	DPAK	plastic single-ended surface-mounted package (DPAK); 3 leads (one lead cropped)	SOT428

## 4. Limiting values

Table 4. Limiting values

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

Symbol	Parameter	Conditions	Min	Max	Unit
$V_{DS}$	drain-source voltage	T <sub>j</sub> ≥ 25 °C; T <sub>j</sub> ≤ 175 °C	-	100	V
$V_{DGR}$	drain-gate voltage	$T_j \le 175 \text{ °C}; T_j \ge 25 \text{ °C}; R_{GS} = 20 \text{ k}\Omega$	-	100	V
$V_{GS}$	gate-source voltage		-20	20	V
I <sub>D</sub>	drain current	$V_{GS} = 10 \text{ V}; T_{mb} = 100 \text{ °C}; \text{ see } \frac{\text{Figure 1}}{\text{Model}}$	-	33	Α
		$V_{GS}$ = 10 V; $T_{mb}$ = 25 °C; see <u>Figure 1</u> ; see <u>Figure 4</u>	-	47	Α
I <sub>DM</sub>	peak drain current	pulsed; T <sub>mb</sub> = 25 °C; see <u>Figure 4</u>	-	188	Α
P <sub>tot</sub>	total power dissipation	T <sub>mb</sub> = 25 °C; see <u>Figure 2</u>	-	150	W
T <sub>stg</sub>	storage temperature		-55	175	°C
Tj	junction temperature		-55	175	°C
Source-dra	in diode				
Is	source current	T <sub>mb</sub> = 25 °C	-	47	Α
I <sub>SM</sub>	peak source current	pulsed; T <sub>mb</sub> = 25 °C	-	188	Α
Avalanche	ruggedness				
E <sub>DS(AL)S</sub>	non-repetitive drain-source avalanche energy	$V_{GS}$ = 10 V; $T_{j(init)}$ = 25 °C; $I_D$ = 40 A; $V_{sup}$ ≤ 25 V; unclamped; $t_p$ = 100 μs; $R_{GS}$ = 50 $\Omega$	-	260	mJ
I <sub>AS</sub>	non-repetitive avalanche current	$V_{sup} \le 25 \text{ V}; V_{GS} = 10 \text{ V}; T_{j(init)} = 25 \text{ °C};$ $R_{GS} = 50 \Omega;$ unclamped; see Figure 3	-	47	Α

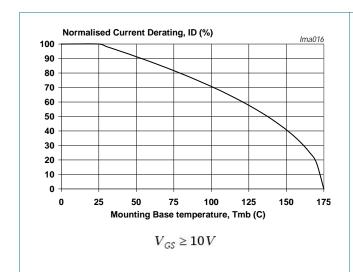
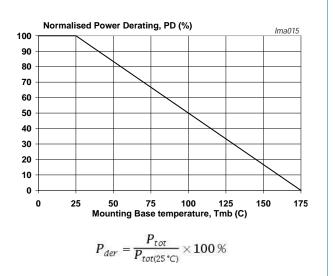


Fig 1. Continuous drain current as a function of mounting base temperature



g 2. Normalized total power dissipation as a function of mounting base temperature

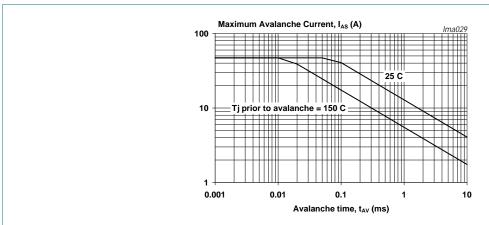
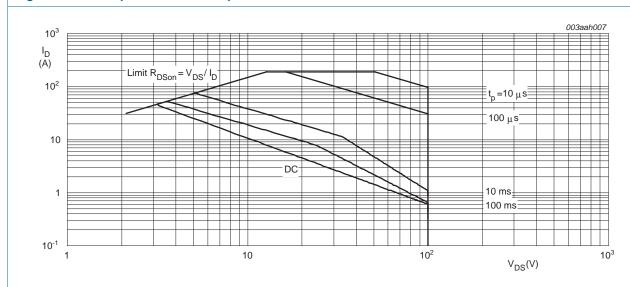


Fig 3. Maximum permissible non-repetitive avalanche current as a function of avalanche time



 $I_{DM}$  is a single pulse

Fig 4. Safe operating area; continuous and peak drain currents as a function of drain-source voltage

#### 5. Thermal characteristics

Table 5. Thermal characteristics

Symbol	Parameter	Conditions	Min	Тур	Max	Unit
$R_{th(j-mb)}$	thermal resistance from junction to mounting base	see Figure 5	-	-	1	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient	SOT428 package ; printed-circuit board mounted ; minimum footprint	-	50	-	K/W

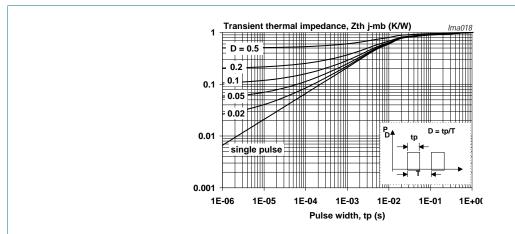


Fig 5. Transient thermal impedance from junction to mounting base as a function of pulse duration

## 6. Characteristics

Table 6. Characteristics

Table 6.	Characteristics					
Symbol	Parameter	Conditions	Min	Тур	Max	Unit
Static cha	racteristics					
V <sub>(BR)DSS</sub>		$I_D = 0.25 \text{ mA}; V_{GS} = 0 \text{ V}; T_j = -55 \text{ °C}$	89	-	-	V
voltage	voltage	$I_D = 0.25 \text{ mA}; V_{GS} = 0 \text{ V}; T_j = 25 \text{ °C}$	100	-	-	V
V <sub>GS(th)</sub> gat	gate-source threshold voltage	$I_D = 1 \text{ mA}$ ; $V_{DS} = V_{GS}$ ; $T_j = 175 \text{ °C}$ ; see Figure 9	1	-		V
		$I_D = 1 \text{ mA}$ ; $V_{DS} = V_{GS}$ ; $T_j = 25 \text{ °C}$ ; see Figure 9; see Figure 10	2	3	4	V
		$I_D = 1$ mA; $V_{DS} = V_{GS}$ ; $T_j = -55$ °C; see Figure 9	-	-	6	V
I <sub>DSS</sub>	drain leakage current	$V_{DS} = 100 \text{ V}; V_{GS} = 0 \text{ V}; T_j = 25 \text{ °C}$	-	0.05	10	μΑ
		$V_{DS} = 100 \text{ V}; V_{GS} = 0 \text{ V}; T_j = 175 ^{\circ}\text{C}$	-	-	500	μΑ
I <sub>GSS</sub>	gate leakage current	$V_{GS} = 10 \text{ V}; V_{DS} = 0 \text{ V}; T_j = 25 \text{ °C}$	-	0.02	100	nΑ
		$V_{GS} = -10 \text{ V}; V_{DS} = 0 \text{ V}; T_j = 25 \text{ °C}$	-	0.02	100	nΑ
DOON	drain-source on-state resistance	$V_{GS} = 10 \text{ V}; I_D = 25 \text{ A}; T_j = 175 ^{\circ}\text{C};$ see Figure 11	-		68	mΩ
		$V_{GS} = 10 \text{ V}; I_D = 25 \text{ A}; T_j = 25 ^{\circ}\text{C};$ see Figure 11; see Figure 12	-	22	25	mΩ
Dynamic o	characteristics					
Q <sub>G(tot)</sub>	total gate charge	$I_D = 45 \text{ A}; V_{DS} = 80 \text{ V}; V_{GS} = 10 \text{ V};$	-	61	-	nC
$Q_{GS}$	gate-source charge	T <sub>j</sub> = 25 °C; see <u>Figure 13</u>	-	13	-	nC
$Q_{GD}$	gate-drain charge		-	25	-	nC
C <sub>iss</sub>	input capacitance	$V_{DS} = 25 \text{ V}; V_{GS} = 0 \text{ V}; f = 1 \text{ MHz};$	-	2600	-	pF
C <sub>oss</sub>	output capacitance	T <sub>j</sub> = 25 °C; see <u>Figure 14</u>	-	340	-	pF
$C_{rss}$	reverse transfer capacitance		-	195	-	pF
t <sub>d(on)</sub>	turn-on delay time	$V_{DS} = 50 \text{ V}; R_L = 1.8 \Omega; V_{GS} = 10 \text{ V};$	-	18	-	ns
t <sub>r</sub>	rise time	$R_{G(ext)} = 5.6 \Omega$ ; $T_j = 25 °C$	-	72	-	ns
$t_{d(off)}$	turn-off delay time		-	69	-	ns
t <sub>f</sub>	fall time		-	58	-	ns
L <sub>D</sub>	internal drain inductance	measured from tab to centre of die ; $T_j = 25  ^{\circ}\text{C}$	-	3.5	-	nΗ
L <sub>S</sub>	internal source inductance	measured from source lead to source bond pad; $T_j = 25$ °C	-	7.5	-	nΗ
Source-dr	rain diode					
$V_{SD}$	source-drain voltage	$I_S = 25 \text{ A}; V_{GS} = 0 \text{ V}; T_j = 25 ^{\circ}\text{C};$ see Figure 15	-	0.87	1.2	V
t <sub>rr</sub>	reverse recovery time	$I_S = 20 \text{ A}; dI_S/dt = -100 \text{ A/}\mu\text{s};$	-	82	-	ns
Qr	recovered charge	$V_{GS} = 0 \text{ V}; V_{DS} = 25 \text{ V}; T_j = 25 \text{ °C}$	-	0.26	-	μC

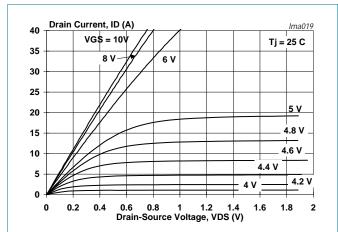


Fig 6. Output characteristics: drain current as a function of drain-source voltage; typical function of drain-source voltage; typical values

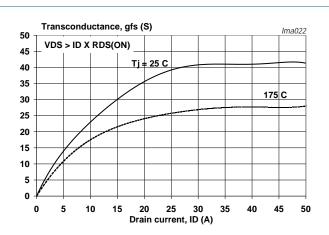


Fig 7. Forward transconductance as a function of drain current; typical values

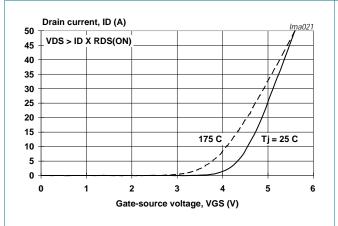
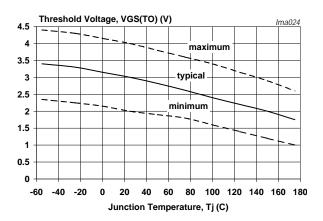


Fig 8. Transfer characteristics: drain current as a function of gate-source voltage; typical values



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

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

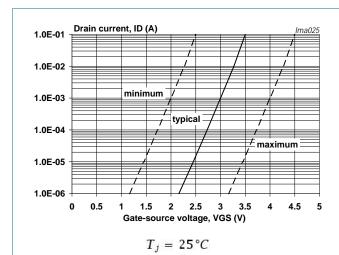


Fig 10. Sub-threshold drain current as a function of gate-source voltage

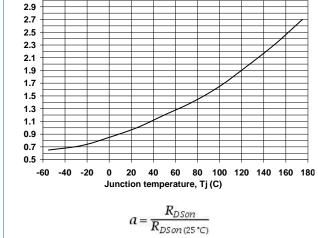


Fig 11. Normalized drain source on-state resistance factor as a function of junction temperature

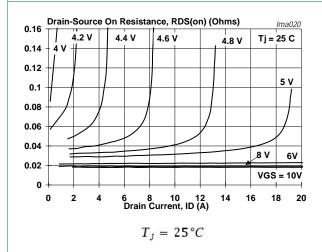


Fig 12. Drain-source on-state resistance as a function of drain current; typical values

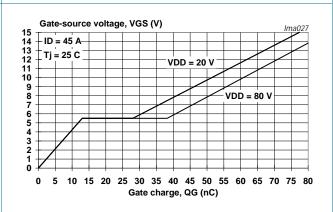


Fig 13. Gate-source voltage as a function of gate charge; typical values

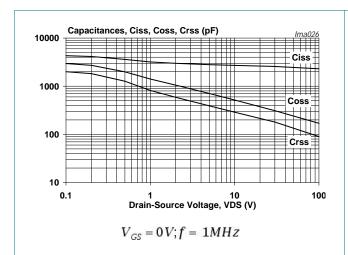


Fig 14. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values

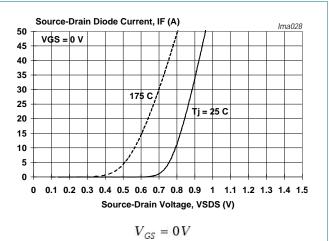


Fig 15. Source current as a function of source-drain voltage; typical values

## 7. Package outline

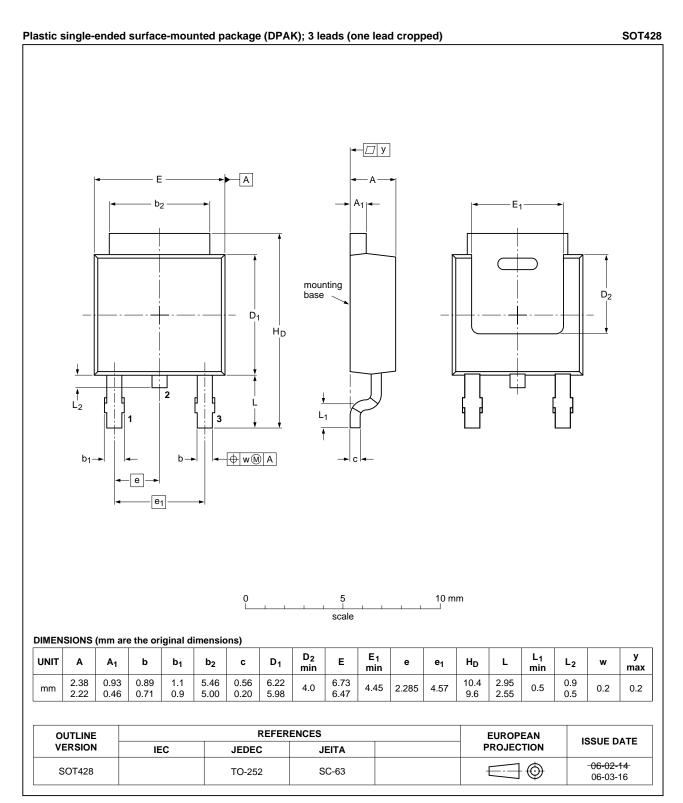


Fig 16. Package outline SOT428 (DPAK)

## 8. Revision history

#### Table 7. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
PSMN025-100D v.4	20120112	Product data sheet	-	PSMN025-100D v.3
Modifications:	<ul> <li>Various changes</li> </ul>	to content.		
PSMN025-100D v.3 20081120 Product data sheet -		-	PSMN025-100D v.2	

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## 11. Contents

1	Product profile
1.1	General description
1.2	Features and benefits
1.3	Applications
1.4	Quick reference data
2	Pinning information
3	Ordering information
4	Limiting values
5	Thermal characteristics
6	Characteristics
7	Package outline
8	Revision history1
9	Legal information1
9.1	Data sheet status
9.2	Definitions1
9.3	Disclaimers
9.4	Trademarks1
10	Contact information 1

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