



# PSMN025-100D

N-channel TrenchMOS SiliconMAX standard level FET

Rev. 4 — 12 January 2012

Product data sheet

## 1. Product profile

### 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

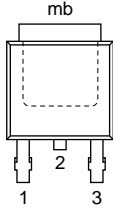
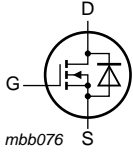
Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{DS}$	drain-source voltage	$T_j \geq 25\text{ °C}$ ; $T_j \leq 175\text{ °C}$	-	-	100	V
$I_D$	drain current	$T_{mb} = 25\text{ °C}$ ; $V_{GS} = 10\text{ V}$ ; see <a href="#">Figure 1</a> ; see <a href="#">Figure 4</a>	-	-	47	A
$P_{tot}$	total power dissipation	$T_{mb} = 25\text{ °C}$ ; see <a href="#">Figure 2</a>	-	-	150	W
<b>Static characteristics</b>						
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = 10\text{ V}$ ; $I_D = 25\text{ A}$ ; $T_j = 25\text{ °C}$ ; see <a href="#">Figure 11</a> ; see <a href="#">Figure 12</a>	-	22	25	m $\Omega$
<b>Dynamic characteristics</b>						
$Q_{GD}$	gate-drain charge	$V_{GS} = 10\text{ V}$ ; $I_D = 45\text{ A}$ ; $V_{DS} = 80\text{ V}$ ; $T_j = 25\text{ °C}$ ; see <a href="#">Figure 13</a>	-	25	-	nC



## 2. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	G	gate		
2	D	drain <sup>[1]</sup>		
3	S	source		
mb	D	mounting base; connected to drain		

**SOT428 (DPAK)**

[1] It is not possible to make connection to pin 2.

## 3. Ordering information

Table 3. Ordering information

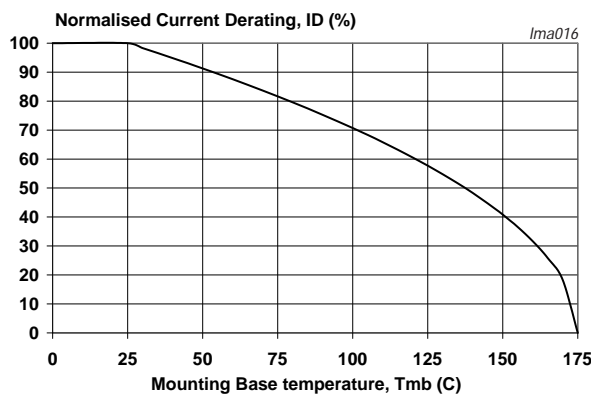
Type number	Package		Version
	Name	Description	
PSMN025-100D	DPAK	plastic single-ended surface-mounted package (DPAK); 3 leads (one lead cropped)	SOT428

## 4. Limiting values

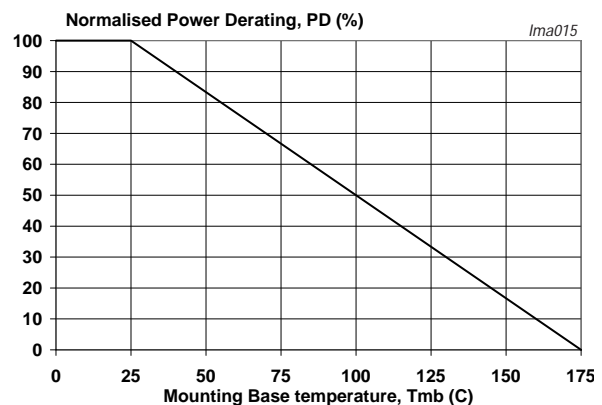
**Table 4. Limiting values**

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

Symbol	Parameter	Conditions	Min	Max	Unit
$V_{DS}$	drain-source voltage	$T_j \geq 25\text{ °C}; T_j \leq 175\text{ °C}$	-	100	V
$V_{DGR}$	drain-gate voltage	$T_j \leq 175\text{ °C}; T_j \geq 25\text{ °C}; R_{GS} = 20\text{ k}\Omega$	-	100	V
$V_{GS}$	gate-source voltage		-20	20	V
$I_D$	drain current	$V_{GS} = 10\text{ V}; T_{mb} = 100\text{ °C}$ ; see <a href="#">Figure 1</a>	-	33	A
		$V_{GS} = 10\text{ V}; T_{mb} = 25\text{ °C}$ ; see <a href="#">Figure 1</a> ; see <a href="#">Figure 4</a>	-	47	A
$I_{DM}$	peak drain current	pulsed; $T_{mb} = 25\text{ °C}$ ; see <a href="#">Figure 4</a>	-	188	A
$P_{tot}$	total power dissipation	$T_{mb} = 25\text{ °C}$ ; see <a href="#">Figure 2</a>	-	150	W
$T_{stg}$	storage temperature		-55	175	°C
$T_j$	junction temperature		-55	175	°C
<b>Source-drain diode</b>					
$I_S$	source current	$T_{mb} = 25\text{ °C}$	-	47	A
$I_{SM}$	peak source current	pulsed; $T_{mb} = 25\text{ °C}$	-	188	A
<b>Avalanche ruggedness</b>					
$E_{DS(AL)S}$	non-repetitive drain-source avalanche energy	$V_{GS} = 10\text{ V}; T_{j(\text{init})} = 25\text{ °C}; I_D = 40\text{ A}; V_{sup} \leq 25\text{ V}; \text{unclamped}; t_p = 100\text{ }\mu\text{s}; R_{GS} = 50\text{ }\Omega$	-	260	mJ
$I_{AS}$	non-repetitive avalanche current	$V_{sup} \leq 25\text{ V}; V_{GS} = 10\text{ V}; T_{j(\text{init})} = 25\text{ °C}; R_{GS} = 50\text{ }\Omega; \text{unclamped}$ ; see <a href="#">Figure 3</a>	-	47	A



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



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

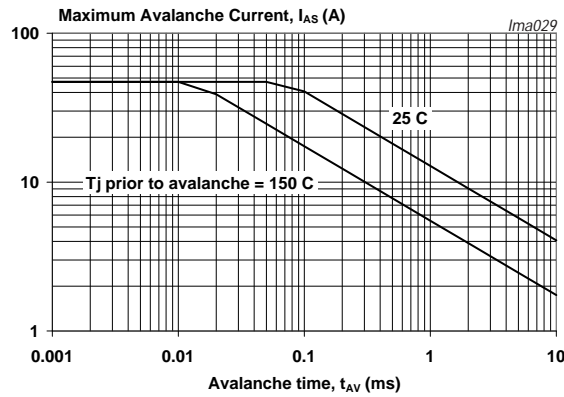


Fig 3. Maximum permissible non-repetitive avalanche current as a function of avalanche time

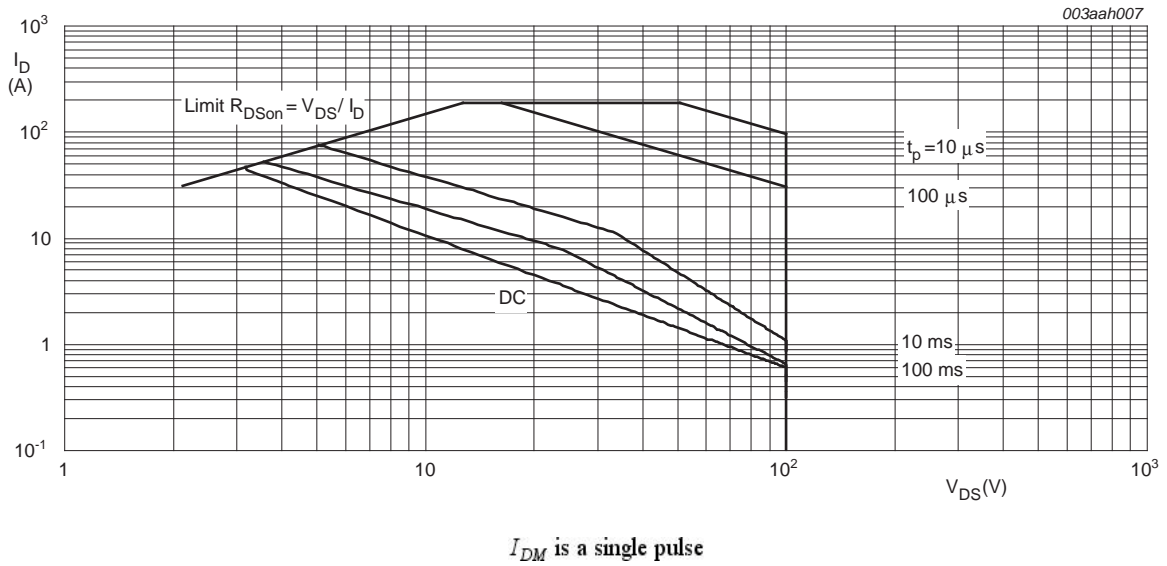


Fig 4. Safe operating area; continuous and peak drain currents as a function of drain-source voltage

### 5. Thermal characteristics

Table 5. Thermal characteristics

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

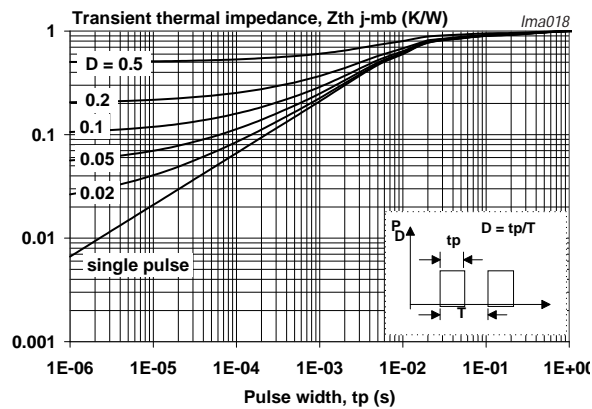


Fig 5. Transient thermal impedance from junction to mounting base as a function of pulse duration

## 6. Characteristics

Table 6. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Static characteristics</b>						
$V_{(BR)DSS}$	drain-source breakdown voltage	$I_D = 0.25 \text{ mA}; V_{GS} = 0 \text{ V}; T_j = -55 \text{ }^\circ\text{C}$	89	-	-	V
		$I_D = 0.25 \text{ mA}; V_{GS} = 0 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$	100	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	$I_D = 1 \text{ mA}; V_{DS} = V_{GS}; T_j = 175 \text{ }^\circ\text{C};$ see <a href="#">Figure 9</a>	1	-	-	V
		$I_D = 1 \text{ mA}; V_{DS} = V_{GS}; T_j = 25 \text{ }^\circ\text{C};$ see <a href="#">Figure 9</a> ; see <a href="#">Figure 10</a>	2	3	4	V
		$I_D = 1 \text{ mA}; V_{DS} = V_{GS}; T_j = -55 \text{ }^\circ\text{C};$ see <a href="#">Figure 9</a>	-	-	6	V
$I_{DSS}$	drain leakage current	$V_{DS} = 100 \text{ V}; V_{GS} = 0 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$	-	0.05	10	$\mu\text{A}$
		$V_{DS} = 100 \text{ V}; V_{GS} = 0 \text{ V}; T_j = 175 \text{ }^\circ\text{C}$	-	-	500	$\mu\text{A}$
$I_{GSS}$	gate leakage current	$V_{GS} = 10 \text{ V}; V_{DS} = 0 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$	-	0.02	100	nA
		$V_{GS} = -10 \text{ V}; V_{DS} = 0 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$	-	0.02	100	nA
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = 10 \text{ V}; I_D = 25 \text{ A}; T_j = 175 \text{ }^\circ\text{C};$ see <a href="#">Figure 11</a>	-	-	68	m $\Omega$
		$V_{GS} = 10 \text{ V}; I_D = 25 \text{ A}; T_j = 25 \text{ }^\circ\text{C};$ see <a href="#">Figure 11</a> ; see <a href="#">Figure 12</a>	-	22	25	m $\Omega$
<b>Dynamic characteristics</b>						
$Q_{G(tot)}$	total gate charge	$I_D = 45 \text{ A}; V_{DS} = 80 \text{ V}; V_{GS} = 10 \text{ V};$ $T_j = 25 \text{ }^\circ\text{C};$ see <a href="#">Figure 13</a>	-	61	-	nC
$Q_{GS}$	gate-source charge		-	13	-	nC
$Q_{GD}$	gate-drain charge		-	25	-	nC
$C_{iss}$	input capacitance	$V_{DS} = 25 \text{ V}; V_{GS} = 0 \text{ V}; f = 1 \text{ MHz};$ $T_j = 25 \text{ }^\circ\text{C};$ see <a href="#">Figure 14</a>	-	2600	-	pF
$C_{oss}$	output capacitance		-	340	-	pF
$C_{riss}$	reverse transfer capacitance		-	195	-	pF
$t_{d(on)}$	turn-on delay time	$V_{DS} = 50 \text{ V}; R_L = 1.8 \text{ } \Omega; V_{GS} = 10 \text{ V};$ $R_{G(ext)} = 5.6 \text{ } \Omega; T_j = 25 \text{ }^\circ\text{C}$	-	18	-	ns
$t_r$	rise time		-	72	-	ns
$t_{d(off)}$	turn-off delay time		-	69	-	ns
$t_f$	fall time		-	58	-	ns
$L_D$	internal drain inductance	measured from tab to centre of die ; $T_j = 25 \text{ }^\circ\text{C}$	-	3.5	-	nH
$L_S$	internal source inductance	measured from source lead to source bond pad ; $T_j = 25 \text{ }^\circ\text{C}$	-	7.5	-	nH
<b>Source-drain diode</b>						
$V_{SD}$	source-drain voltage	$I_S = 25 \text{ A}; V_{GS} = 0 \text{ V}; T_j = 25 \text{ }^\circ\text{C};$ see <a href="#">Figure 15</a>	-	0.87	1.2	V
$t_{rr}$	reverse recovery time	$I_S = 20 \text{ A}; dI_S/dt = -100 \text{ A}/\mu\text{s};$ $V_{GS} = 0 \text{ V}; V_{DS} = 25 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$	-	82	-	ns
$Q_r$	recovered charge		-	0.26	-	$\mu\text{C}$

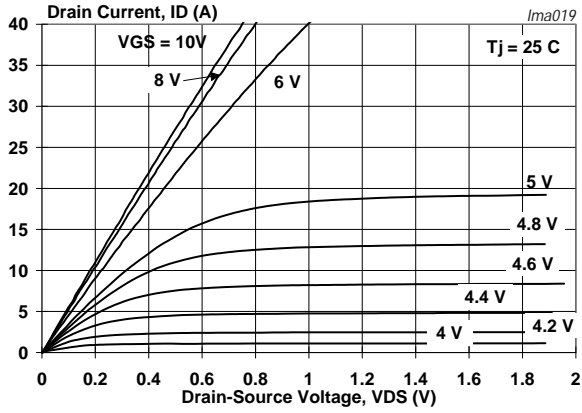


Fig 6. Output characteristics: drain current as a function of drain-source voltage; typical function of drain-source voltage; typical values

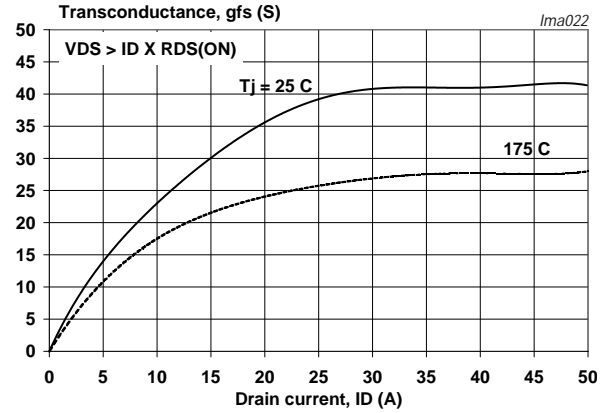


Fig 7. Forward transconductance as a function of drain current; typical values

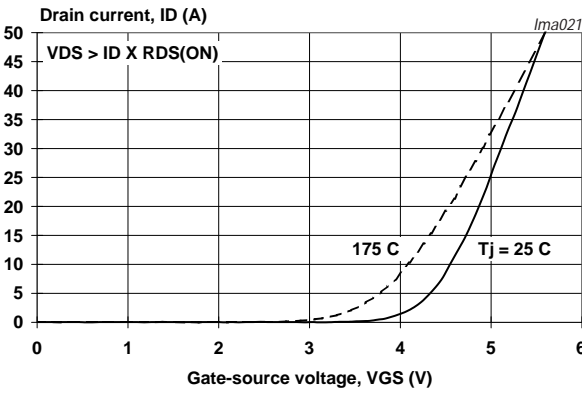


Fig 8. Transfer characteristics: drain current as a function of gate-source voltage; typical values

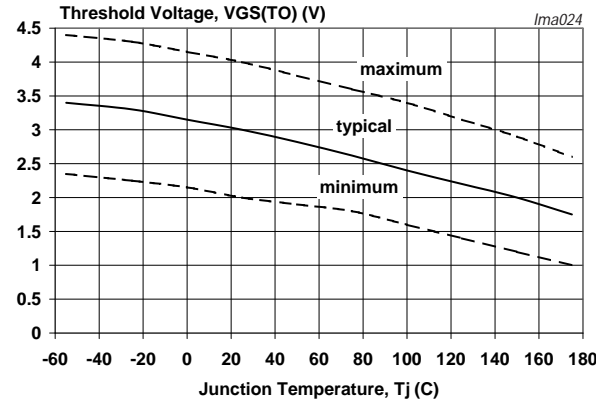


Fig 9. Gate-source threshold voltage as a function of junction temperature

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

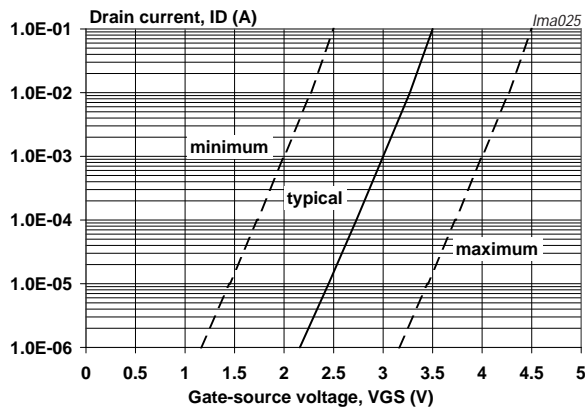


Fig 10. Sub-threshold drain current as a function of gate-source voltage

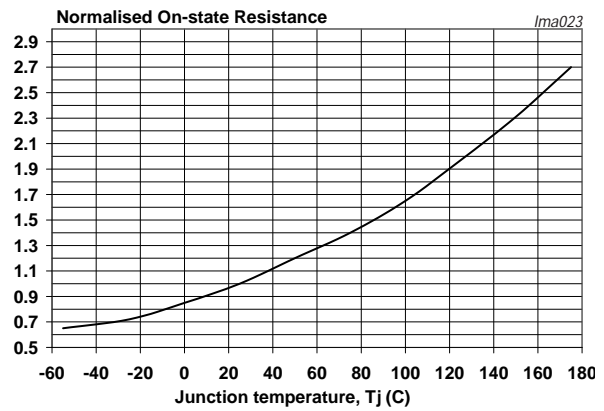


Fig 11. Normalized drain source on-state resistance factor as a function of junction temperature

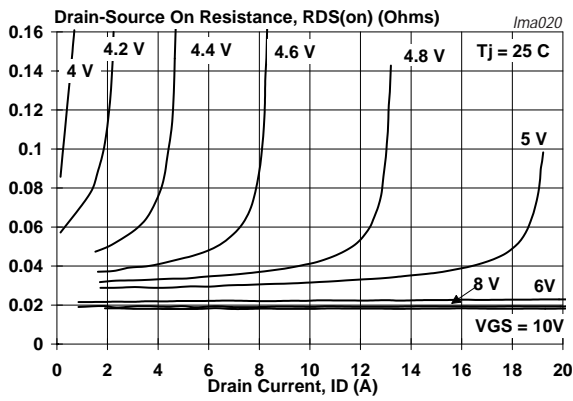


Fig 12. Drain-source on-state resistance as a function of drain current; typical values

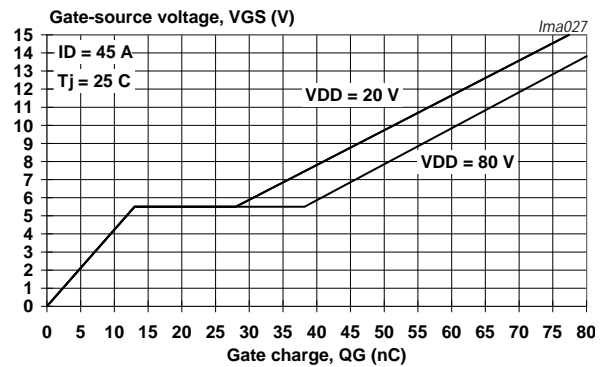
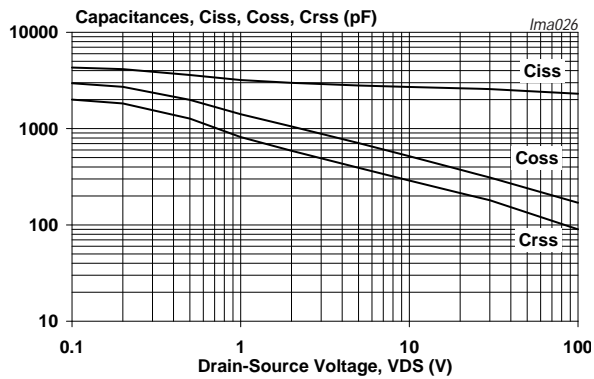
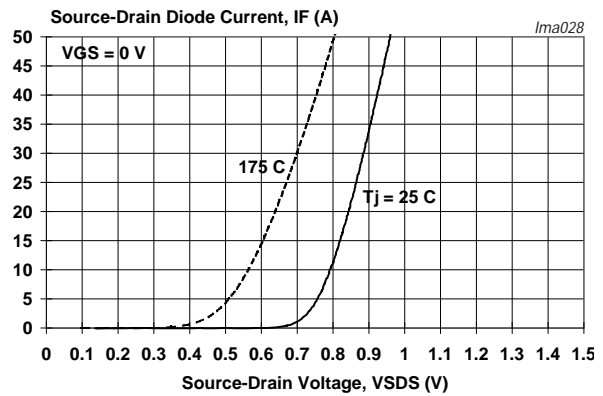


Fig 13. Gate-source voltage as a function of gate charge; typical values



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

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



$V_{GS} = 0V$

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

7. Package outline

Plastic single-ended surface-mounted package (DPAK); 3 leads (one lead cropped)

SOT428

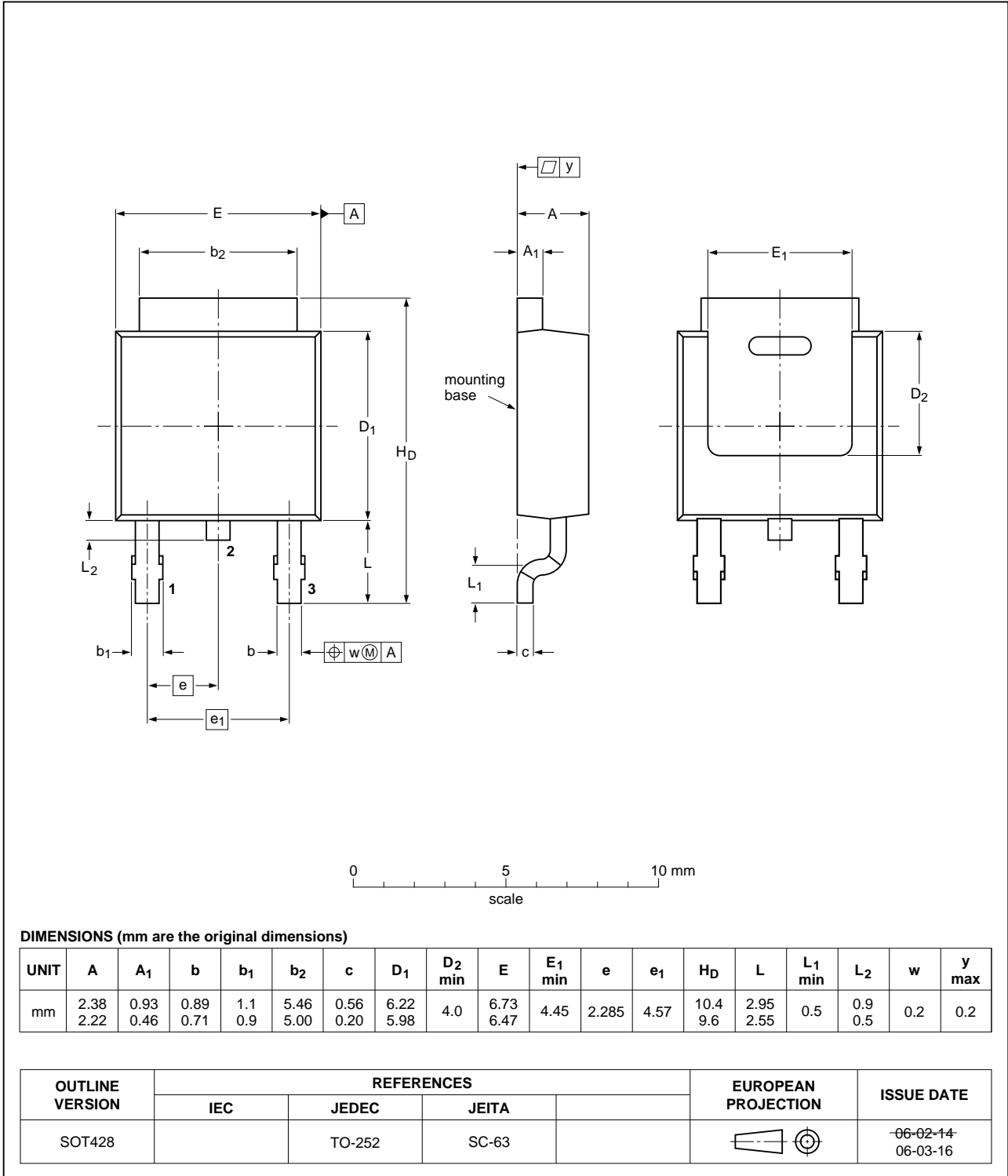


Fig 16. Package outline SOT428 (DPAK)

## 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:	• Various changes to content.			
PSMN025-100D v.3	20081120	Product data sheet	-	PSMN025-100D v.2

## 9. Legal information

### 9.1 Data sheet status

Document status <a href="#">[1]</a> <a href="#">[2]</a>	Product status <a href="#">[3]</a>	Definition
Objective [short] data sheet	Development	This document contains data from the objective specification for product development.
Preliminary [short] data sheet	Qualification	This document contains data from the preliminary specification.
Product [short] data sheet	Production	This document contains the product specification.

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