



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

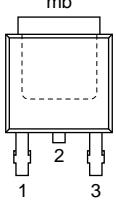
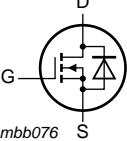
Table 1. Quick reference data

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

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2. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	G	gate		
2	D	drain ^[1]		
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	$T_j \geq 25^\circ\text{C}; T_j \leq 175^\circ\text{C}$	-	100	V
V_{DGR}	drain-gate voltage	$T_j \leq 175^\circ\text{C}; T_j \geq 25^\circ\text{C}; R_{GS} = 20\text{ k}\Omega$	-	100	V
V_{GS}	gate-source voltage		-20	20	V
I_D	drain current	$V_{GS} = 10\text{ V}; T_{mb} = 100^\circ\text{C}$; see Figure 1	-	33	A
		$V_{GS} = 10\text{ V}; T_{mb} = 25^\circ\text{C}$; see Figure 1 ; see Figure 4	-	47	A
I_{DM}	peak drain current	pulsed; $T_{mb} = 25^\circ\text{C}$; see Figure 4	-	188	A
P_{tot}	total power dissipation	$T_{mb} = 25^\circ\text{C}$; see Figure 2	-	150	W
T_{stg}	storage temperature		-55	175	°C
T_j	junction temperature		-55	175	°C
Source-drain diode					
I_S	source current	$T_{mb} = 25^\circ\text{C}$	-	47	A
I_{SM}	peak source current	pulsed; $T_{mb} = 25^\circ\text{C}$	-	188	A
Avalanche ruggedness					
$E_{DS(AL)S}$	non-repetitive drain-source avalanche energy	$V_{GS} = 10\text{ V}; T_{j(init)} = 25^\circ\text{C}; I_D = 40\text{ A}; V_{sup} \leq 25\text{ V}$; unclamped; $t_p = 100\text{ }\mu\text{s}; R_{GS} = 50\text{ }\Omega$	-	260	mJ
I_{AS}	non-repetitive avalanche current	$V_{sup} \leq 25\text{ V}; V_{GS} = 10\text{ V}; T_{j(init)} = 25^\circ\text{C}; R_{GS} = 50\text{ }\Omega$; unclamped; see Figure 3	-	47	A

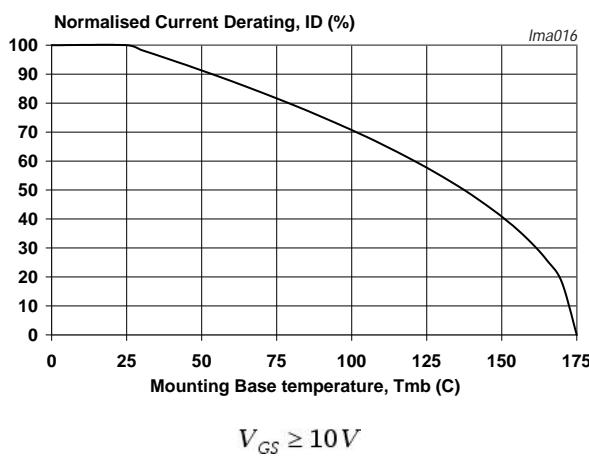


Fig 1. Continuous drain current as a function of mounting base temperature

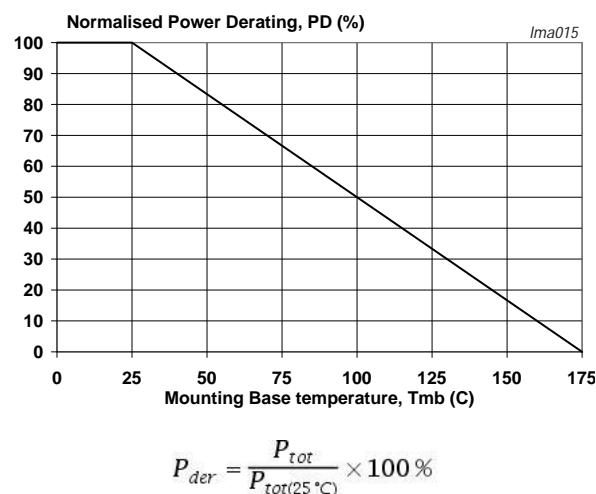


Fig 2. Normalized total power dissipation as a function of mounting base temperature

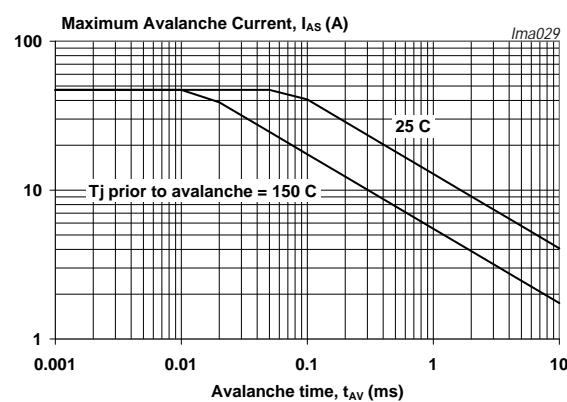
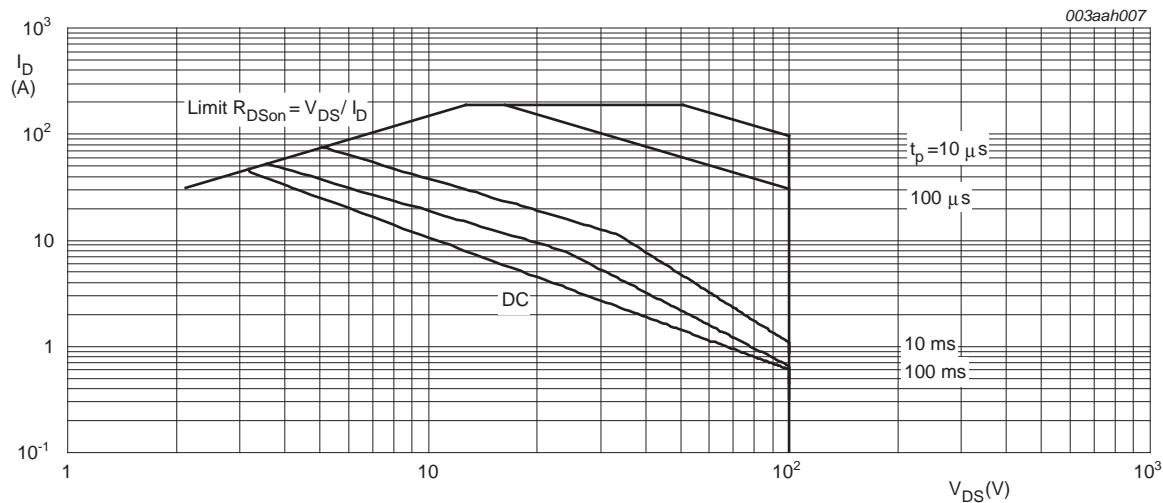


Fig 3. Maximum permissible non-repetitive avalanche current as a function of avalanche time



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

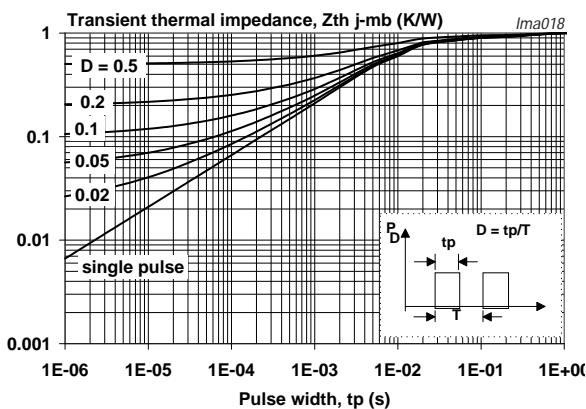


Fig 5. Transient thermal impedance from junction to mounting base as a function of pulse duration

6. Characteristics

Table 6. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static characteristics						
$V_{(BR)DSS}$	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 Figure 9	1	-	-	V
		$I_D = 1 \text{ mA}; V_{DS} = V_{GS}; T_j = 25 \text{ }^\circ\text{C};$ see Figure 9 ; see Figure 10	2	3	4	V
		$I_D = 1 \text{ mA}; V_{DS} = V_{GS}; T_j = -55 \text{ }^\circ\text{C};$ see Figure 9	-	-	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	μA
		$V_{DS} = 100 \text{ V}; V_{GS} = 0 \text{ V}; T_j = 175 \text{ }^\circ\text{C}$	-	-	500	μA
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_{DSon}	drain-source on-state resistance	$V_{GS} = 10 \text{ V}; I_D = 25 \text{ A}; T_j = 175 \text{ }^\circ\text{C};$ see Figure 11	-	-	68	$\text{m}\Omega$
		$V_{GS} = 10 \text{ V}; I_D = 25 \text{ A}; T_j = 25 \text{ }^\circ\text{C};$ see Figure 11 ; see Figure 12	-	22	25	$\text{m}\Omega$
Dynamic characteristics						
$Q_{G(\text{tot})}$	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	$T_j = 25 \text{ }^\circ\text{C}$; see Figure 13	-	13	-	nC
Q_{GD}	gate-drain charge		-	25	-	nC
C_{iss}	input capacitance	$V_{DS} = 25 \text{ V}; V_{GS} = 0 \text{ V}; f = 1 \text{ MHz};$	-	2600	-	pF
C_{oss}	output capacitance	$T_j = 25 \text{ }^\circ\text{C}$; see Figure 14	-	340	-	pF
C_{rss}	reverse transfer capacitance		-	195	-	pF
$t_{d(on)}$	turn-on delay time	$V_{DS} = 50 \text{ V}; R_L = 1.8 \Omega; V_{GS} = 10 \text{ V};$	-	18	-	ns
t_r	rise time	$R_{G(\text{ext})} = 5.6 \Omega; T_j = 25 \text{ }^\circ\text{C}$	-	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
Source-drain diode						
V_{SD}	source-drain voltage	$I_S = 25 \text{ A}; V_{GS} = 0 \text{ V}; T_j = 25 \text{ }^\circ\text{C};$ see Figure 15	-	0.87	1.2	V
t_{rr}	reverse recovery time	$I_S = 20 \text{ A}; dI_S/dt = -100 \text{ A}/\mu\text{s};$	-	82	-	ns
Q_r	recovered charge	$V_{GS} = 0 \text{ V}; V_{DS} = 25 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$	-	0.26	-	μC

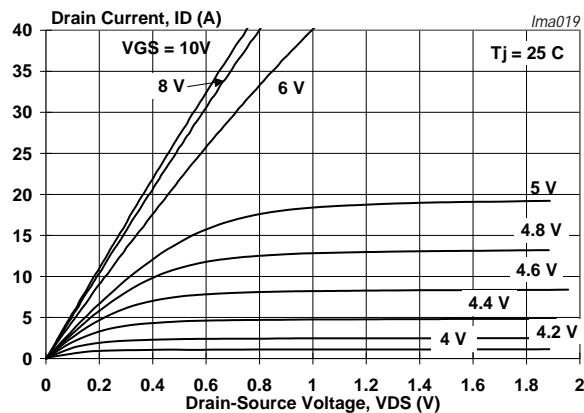


Fig 6. Output characteristics: drain current as a function of drain-source voltage; typical function of drain-source voltage; typical values

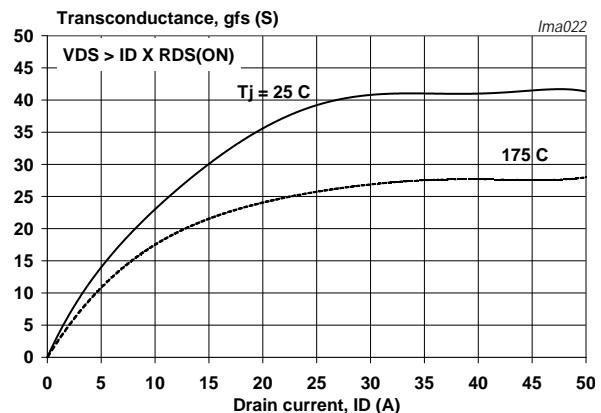


Fig 7. Forward transconductance as a function of drain current; typical values

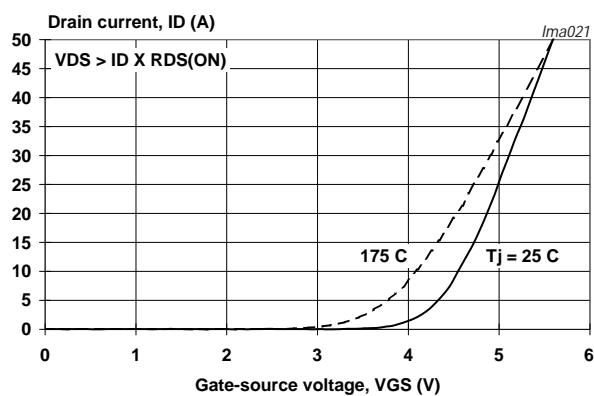


Fig 8. Transfer characteristics: drain current as a function of gate-source voltage; typical values

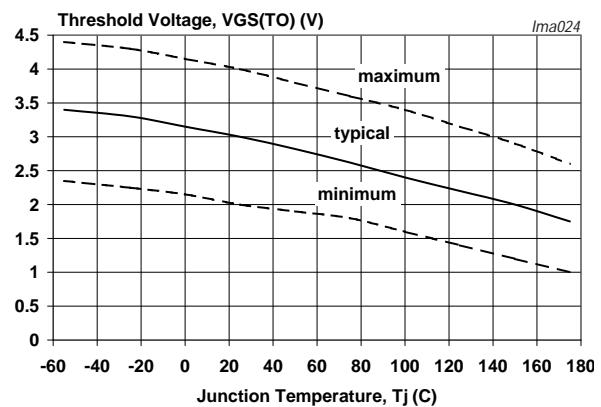
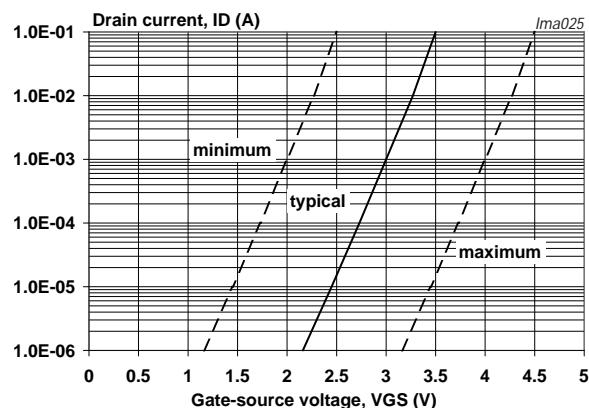
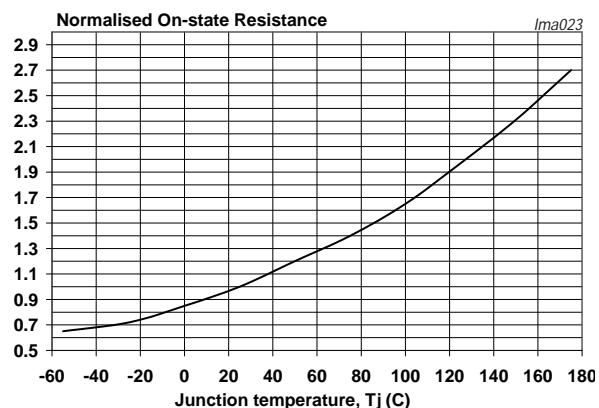


Fig 9. Gate-source threshold voltage as a function of junction temperature



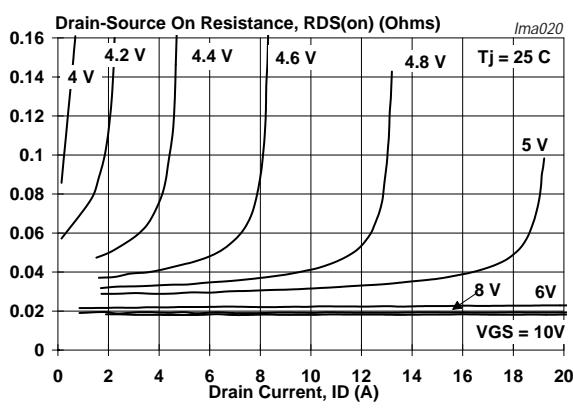
$T_j = 25^\circ\text{C}$

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



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

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



$T_j = 25^\circ\text{C}$

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

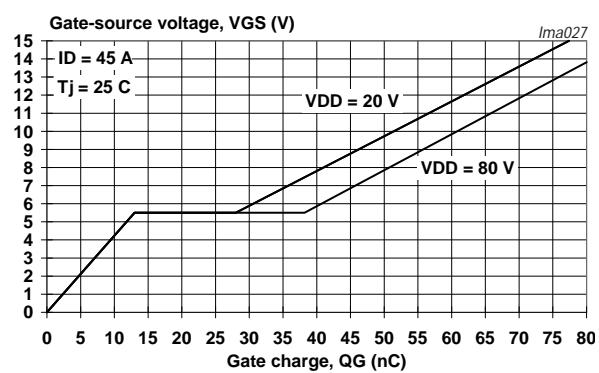


Fig 13. Gate-source voltage as a function of gate charge; typical values

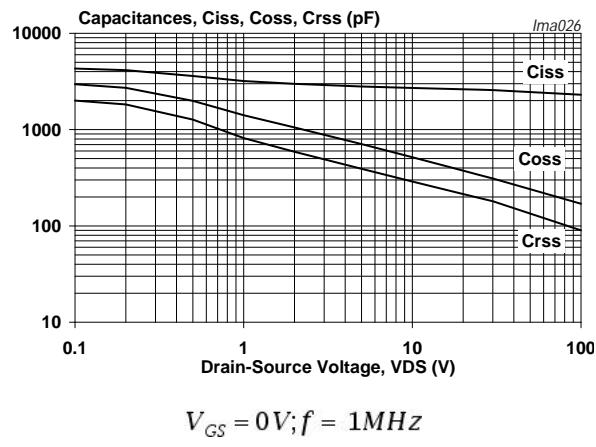


Fig 14. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values

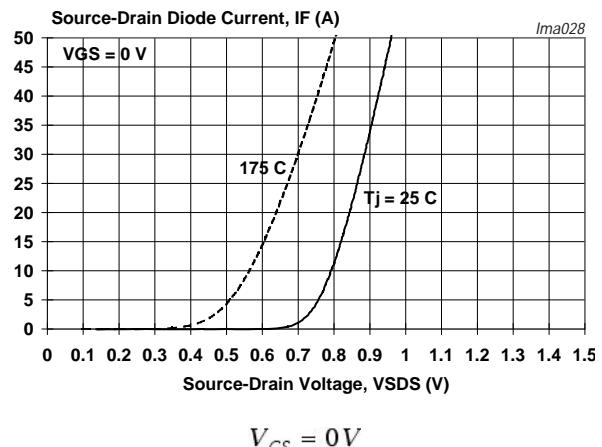


Fig 15. Source current as a function of source-drain voltage; typical values

7. Package outline

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

SOT428

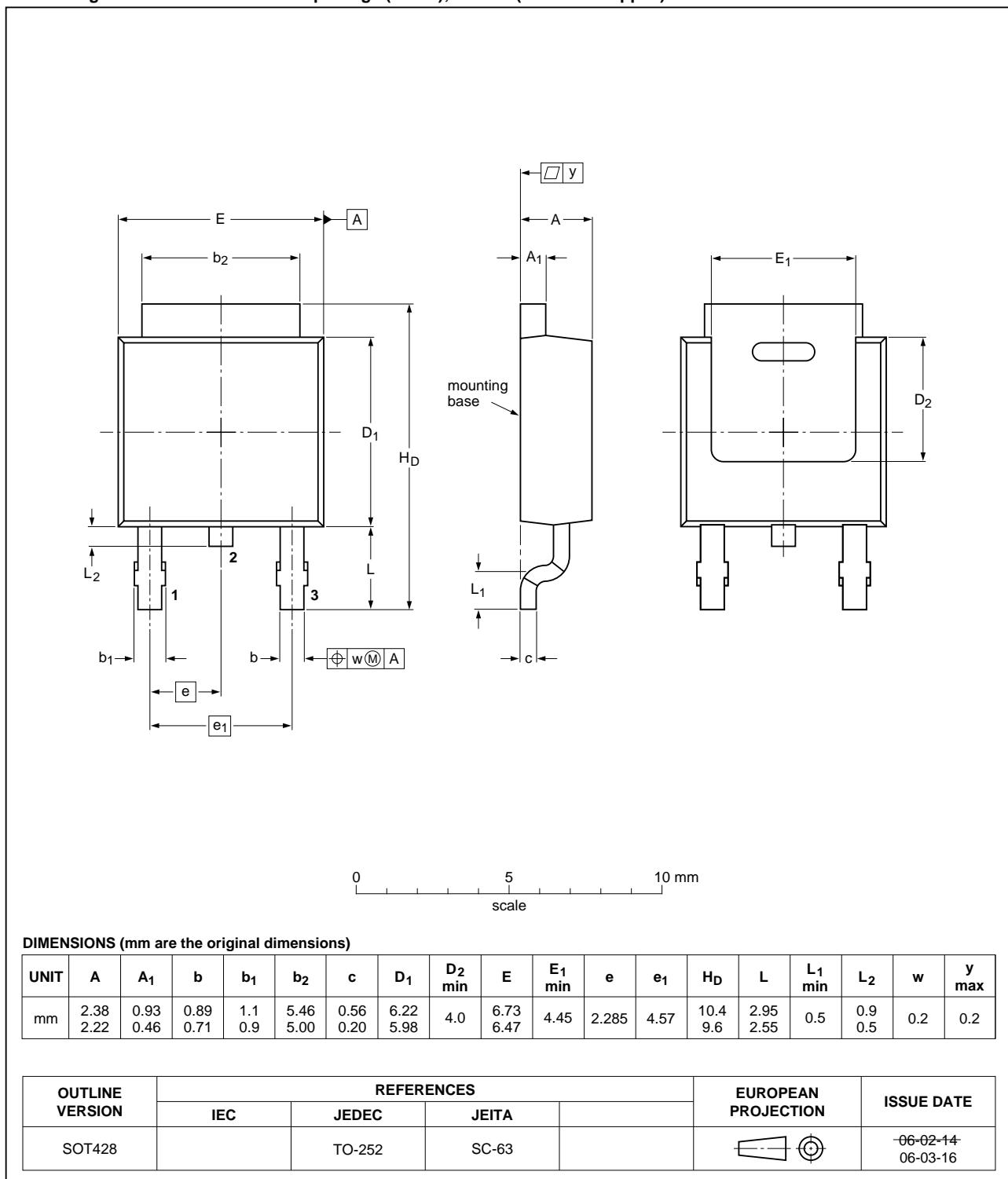


Fig 16. Package outline SOT428 (DPAK)

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 [1] [2]	Product status [3]	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.

[1] Please consult the most recently issued document before initiating or completing a design.

[2] The term 'short data sheet' is explained in section "Definitions".

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