

PSMN004-36B

N-channel TrenchMOS SiliconMAX logic level FET

Rev. 02 — 1 March 2010

Product data sheet

1. Product profile

1.1 General description

SiliconMAX logic 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

- 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 convertors
- Switched-mode power supplies

1.4 Quick reference data

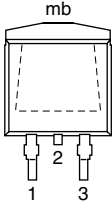
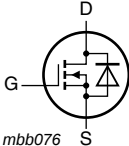
Table 1. Quick reference

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{DS}	drain-source voltage	$T_j \geq 25\text{ }^{\circ}\text{C}$; $T_j \leq 175\text{ }^{\circ}\text{C}$	-	-	36	V
I_D	drain current	$T_{mb} = 25\text{ }^{\circ}\text{C}$; $V_{GS} = 5\text{ V}$; see Figure 1 and 3	-	-	75	A
P_{tot}	total power dissipation	$T_{mb} = 25\text{ }^{\circ}\text{C}$; see Figure 2	-	-	230	W
Dynamic characteristics						
Q_{GD}	gate-drain charge	$V_{GS} = 5\text{ V}$; $I_D = 75\text{ A}$; $V_{DS} = 15\text{ V}$; $T_j = 25\text{ }^{\circ}\text{C}$; see Figure 11	-	39	-	nC
Static characteristics						
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = 10\text{ V}$; $I_D = 25\text{ A}$; $T_j = 25\text{ }^{\circ}\text{C}$; see Figure 9 and 10	-	3.5	4	m Ω
		$V_{GS} = 5\text{ V}$; $I_D = 25\text{ A}$; $T_j = 25\text{ }^{\circ}\text{C}$; see Figure 9 and 10	-	4	5	m Ω



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		

SOT404 (D2PAK)

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

3. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PSMN004-36B	D2PAK	plastic single-ended surface-mounted package (D2PAK); 3 leads (one lead cropped)	SOT404

4. Limiting values

Table 4. Limiting values

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

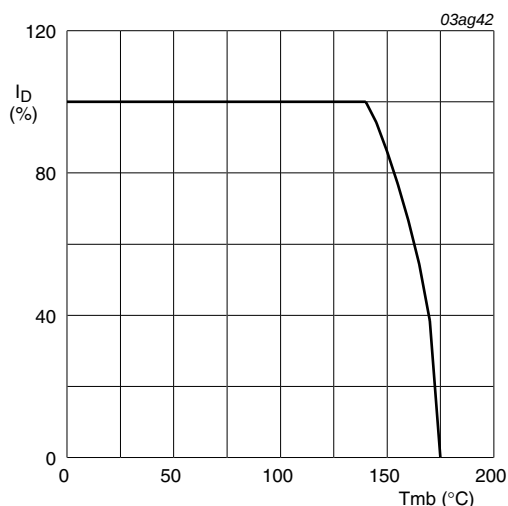
Symbol	Parameter	Conditions	Min	Max	Unit
V _{DS}	drain-source voltage	T _j ≥ 25 °C; T _j ≤ 175 °C	-	36	V
V _{DGR}	drain-gate voltage	T _j ≥ 25 °C; T _j ≤ 175 °C; R _{GS} = 20 kΩ	-	36	V
V _{GS}	gate-source voltage		-15	15	V
I _D	drain current	V _{GS} = 5 V; T _{mb} = 100 °C; see Figure 1	-	75	A
		V _{GS} = 5 V; T _{mb} = 25 °C; see Figure 1 and 3	-	75	A
I _{DM}	peak drain current	t _p ≤ 10 μs; pulsed; T _{mb} = 25 °C; see Figure 3	-	240	A
P _{tot}	total power dissipation	T _{mb} = 25 °C; see Figure 2	-	230	W
T _{stg}	storage temperature		-55	175	°C
T _j	junction temperature		-55	175	°C
V _{GSM}	peak gate-source voltage	pulsed; δ = 25 %; t _p ≤ 50 μs; T _j ≤ 150 °C	-20	20	V

Source-drain diode

I _S	source current	T _{mb} = 25 °C	-	75	A
I _{SM}	peak source current	t _p ≤ 10 μs; pulsed; T _{mb} = 25 °C	-	240	A

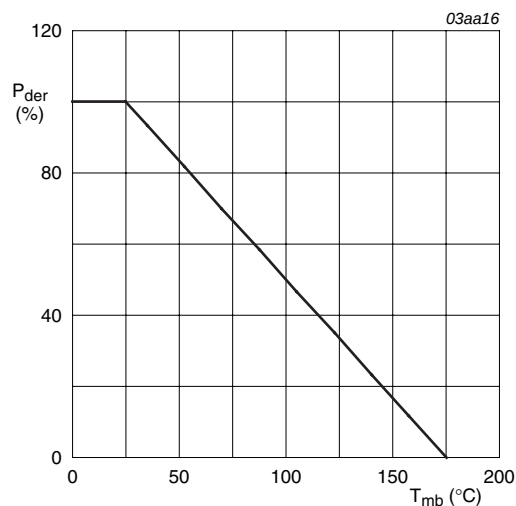
Avalanche ruggedness

E _{DS(AL)S}	non-repetitive drain-source avalanche energy	V _{GS} = 5 V; T _{j(init)} = 25 °C; I _D = 75 A; V _{sup} = 15 V; unclamped; t _p = 0.1 ms; R _{GS} = 50 Ω	-	120	mJ
I _{AS}	non-repetitive avalanche current	V _{sup} = 15 V; V _{GS} = 5 V; T _{j(init)} = 25 °C; R _{GS} = 50 Ω; unclamped	-	75	A



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

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



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

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

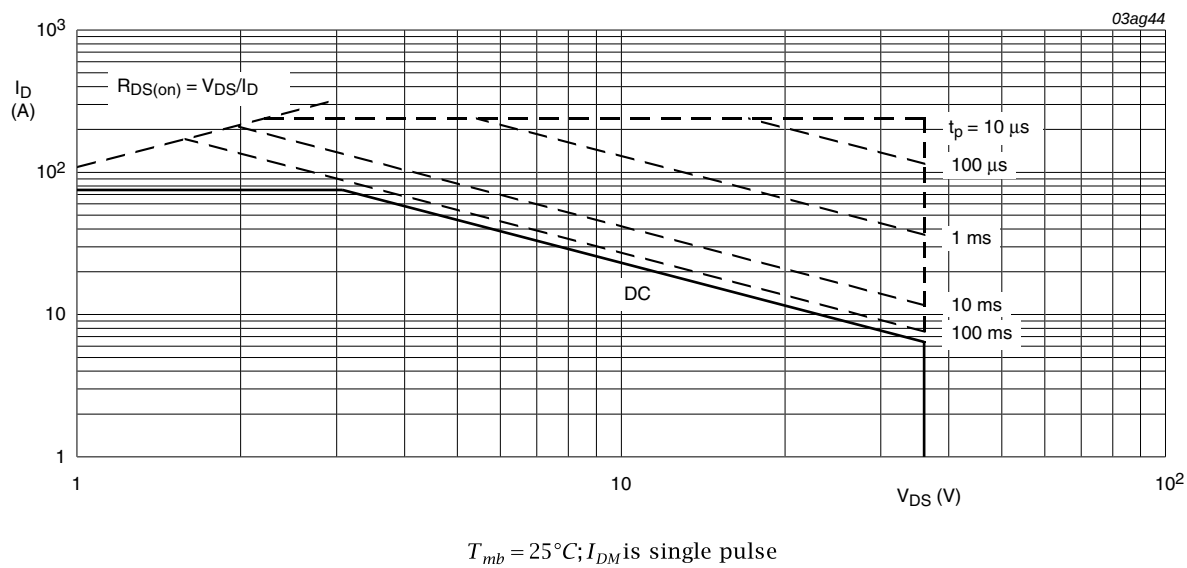


Fig 3. Safe operating area; continuous and peak drain currents as a function of drain-source voltage

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 Figure 4	-	-	0.65	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient	mounted on a printed-circuit board; minimum footprint	-	-	50	K/W

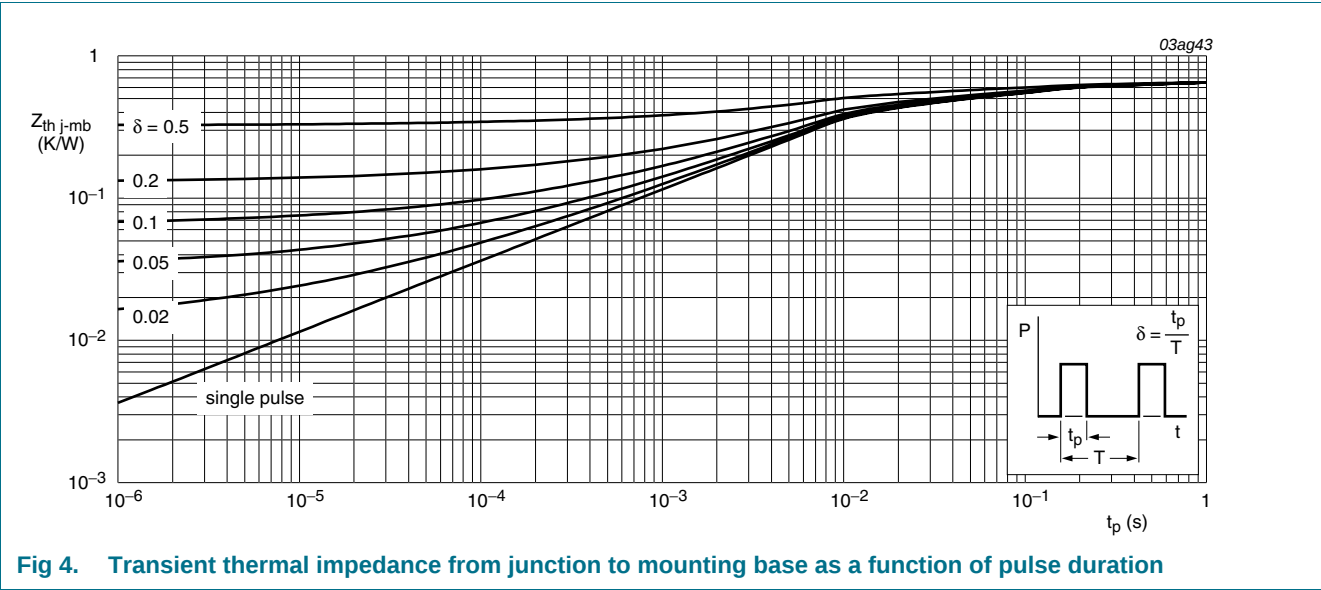
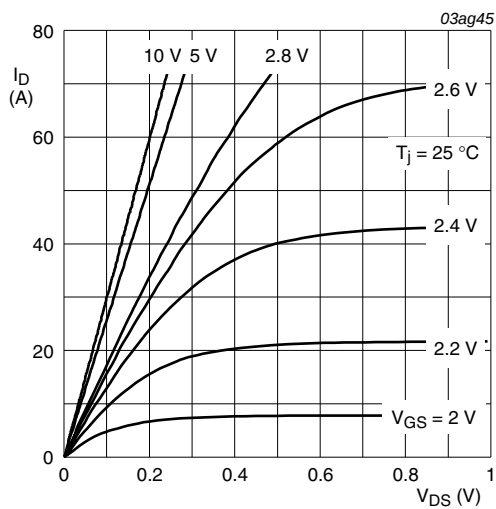


Fig 4. Transient thermal impedance from junction to mounting base as a function of pulse duration

6. Characteristics

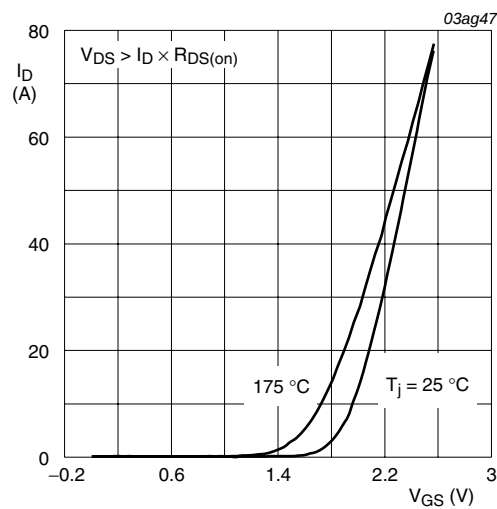
Table 6. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static characteristics						
V _{(BR)DSS}	drain-source breakdown voltage	I _D = 0.25 mA; V _{GS} = 0 V; T _j = 25 °C	36	-	-	V
		I _D = 0.25 mA; V _{GS} = 0 V; T _j = -55 °C	32	-	-	V
V _{GS(th)}	gate-source threshold voltage	I _D = 1 mA; V _{DS} = V _{GS} ; T _j = 175 °C; see Figure 8	0.5	-	-	V
		I _D = 1 mA; V _{DS} = V _{GS} ; T _j = -55 °C; see Figure 8	-	-	2.3	V
		I _D = 1 mA; V _{DS} = V _{GS} ; T _j = 25 °C; see Figure 8	1	1.5	2	V
I _{DSS}	drain leakage current	V _{DS} = 30 V; V _{GS} = 0 V; T _j = 25 °C	-	0.05	10	μA
		V _{DS} = 30 V; V _{GS} = 0 V; T _j = 175 °C	-	-	500	μA
I _{GSS}	gate leakage current	V _{GS} = 10 V; V _{DS} = 0 V; T _j = 25 °C	-	1	100	nA
		V _{GS} = -10 V; V _{DS} = 0 V; T _j = 25 °C	-	1	100	nA
R _{DSon}	drain-source on-state resistance	V _{GS} = 10 V; I _D = 25 A; T _j = 25 °C; see Figure 9 and 10	-	3.5	4	mΩ
		V _{GS} = 5 V; I _D = 25 A; T _j = 175 °C; see Figure 9 and 10	-	-	9.25	mΩ
		V _{GS} = 4.5 V; I _D = 25 A; T _j = 25 °C; see Figure 9 and 10	-	-	5.4	mΩ
		V _{GS} = 5 V; I _D = 25 A; T _j = 25 °C; see Figure 9 and 10	-	4	5	mΩ
Dynamic characteristics						
Q _{G(tot)}	total gate charge	I _D = 75 A; V _{DS} = 15 V; V _{GS} = 5 V; T _j = 25 °C; see Figure 11	-	97	-	nC
Q _{GS}	gate-source charge		-	20	-	nC
Q _{GD}	gate-drain charge		-	39	-	nC
C _{iss}	input capacitance	V _{DS} = 20 V; V _{GS} = 0 V; f = 1 MHz; T _j = 25 °C; see Figure 12	-	6000	-	pF
C _{oss}	output capacitance		-	1700	-	pF
C _{rss}	reverse transfer capacitance		-	1400	-	pF
t _{d(on)}	turn-on delay time	V _{DS} = 15 V; R _L = 1.2 Ω; V _{GS} = 5 V; R _{G(ext)} = 6 Ω; T _j = 25 °C	-	45	-	ns
t _r	rise time		-	220	-	ns
t _{d(off)}	turn-off delay time		-	435	-	ns
t _f	fall time		-	320	-	ns
Source-drain diode						
V _{SD}	source-drain voltage	I _S = 75 A; V _{GS} = 0 V; T _j = 25 °C; see Figure 13	-	1.1	-	V
		I _S = 25 A; V _{GS} = 0 V; T _j = 25 °C; see Figure 13	-	0.85	1.2	V
t _{rr}	reverse recovery time	I _S = 20 A; dI _S /dt = -100 A/μs; V _{GS} = 0 V; V _{DS} = 25 V; T _j = 25 °C	-	400	-	ns
Q _r	recovered charge	V _{DS} = 25 V; T _j = 25 °C	-	1	-	μC



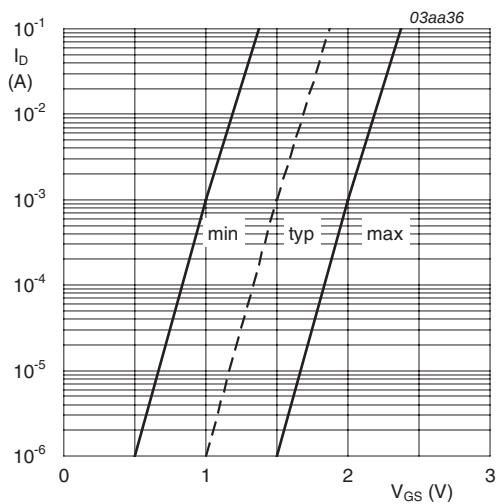
$T_j = 25^\circ\text{C}$

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



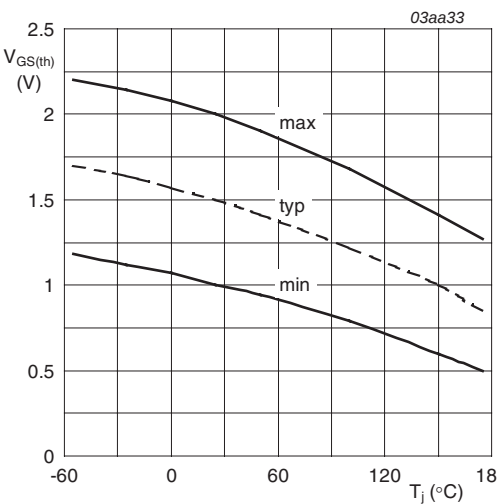
$T_j = 25^\circ\text{C}$ and 175°C ; $V_{DS} > I_D \times R_{DS(on)}$

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



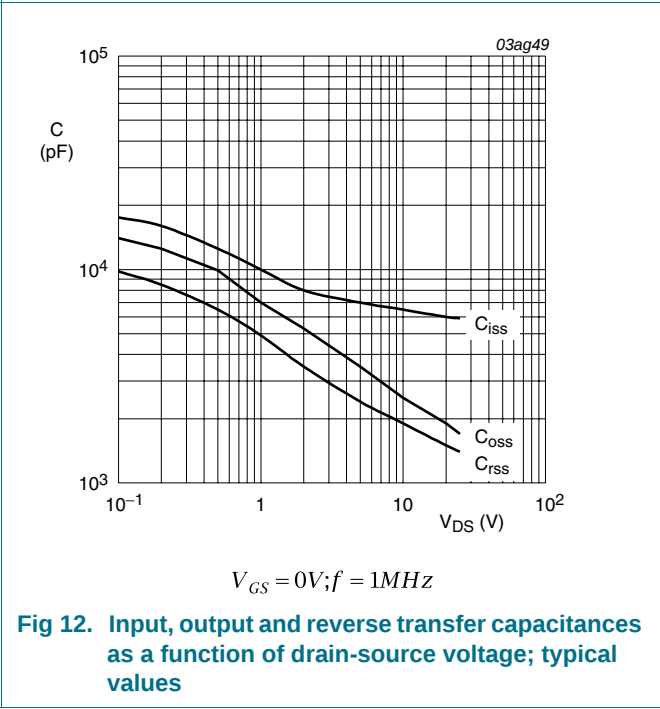
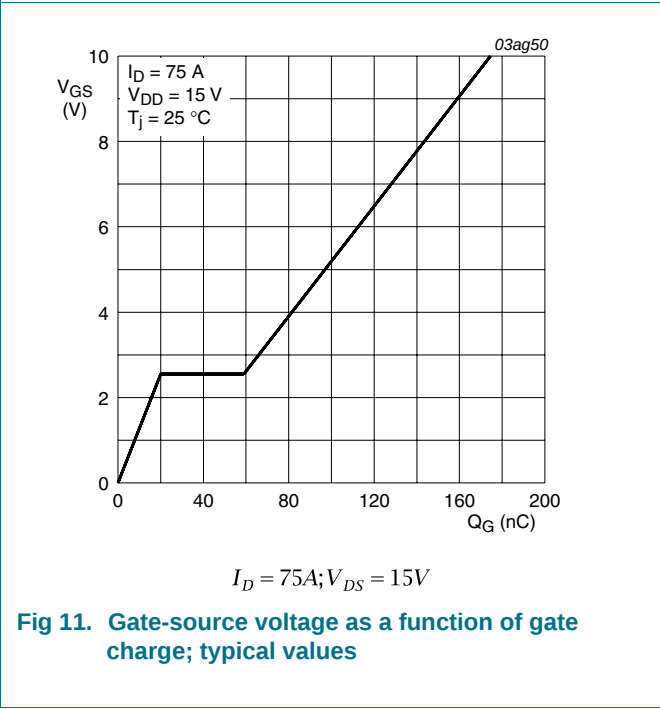
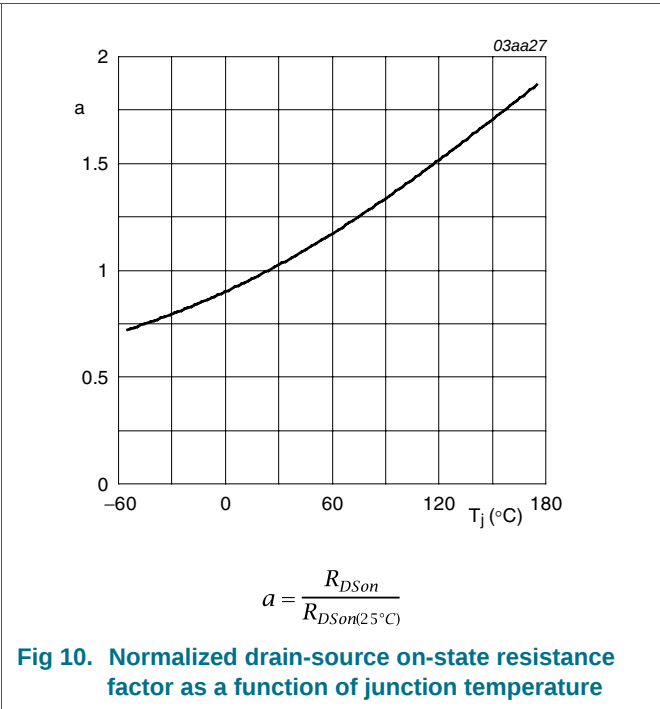
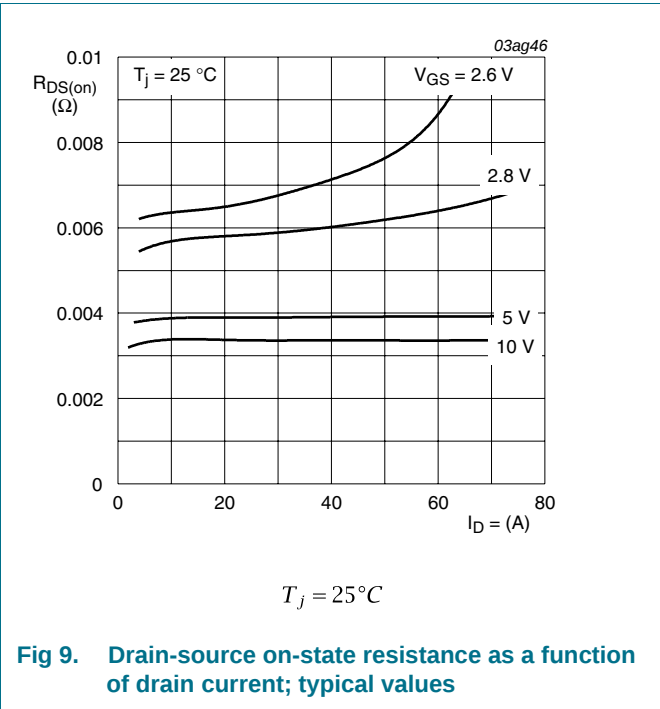
$T_j = 25^\circ\text{C}$; $V_{DS} = V_{GS}$

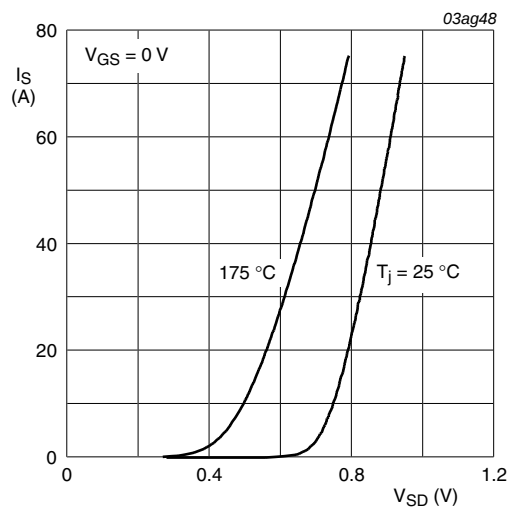
Fig 7. Sub-threshold drain current as a function of gate-source voltage



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

Fig 8. Gate-source threshold voltage as a function of junction temperature





$T_J = 25^\circ\text{C}$ and 175°C ; $V_{GS} = 0\text{ V}$

Fig 13. Source current as a function of source-drain voltage; typical values

7. Package outline

Plastic single-ended surface-mounted package (D2PAK); 3 leads (one lead cropped)

SOT404

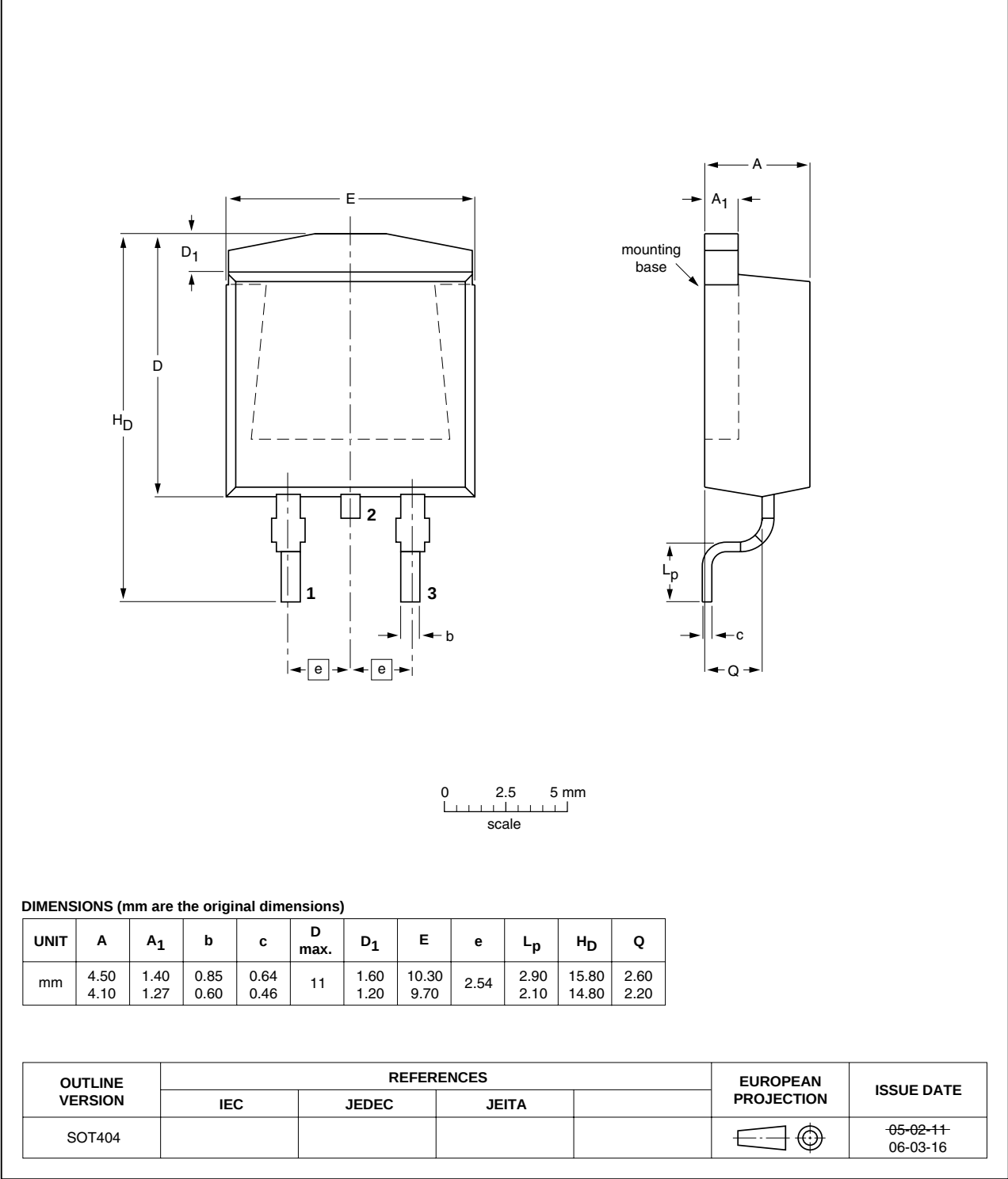


Fig 14. Package outline SOT404 (D2PAK)

8. Revision history

Table 7. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
PSMN004-36B_2	20100301	Product data sheet	-	PSMN004_36P_36B-01
Modifications:	• The format of this data sheet has been redesigned to comply with the new identity guidelines of NXP Semiconductors. • Legal texts have been adapted to the new company name where appropriate. • Type number PSMN004-36B_2 separated from data sheet PSMN004_36P_36B-01.			
PSMN004_36P_36B-01	20011119	Product data	-	-

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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