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PSMN005-75B

N-channel TrenchMOS SiliconMAX standard level FET

Rev. 01 — 16 November 2009 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

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

1.3 Applications

- High frequency computer motherboard DC-to-DC convertors
- OR-ing applicationss

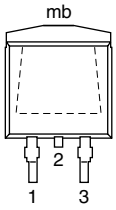
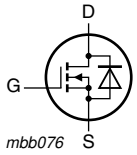
1.4 Quick reference data

Table 1. Quick reference

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{DS}	drain-source voltage	$T_j \geq 25$ °C; $T_j \leq 175$ °C	-	-	75	V
I_D	drain current	$T_{mb} = 25$ °C; $V_{GS} = 10$ V; see Figure 1 and 3	-	-	75	A
P_{tot}	total power dissipation	$T_{mb} = 25$ °C; see Figure 2	-	-	230	W
Dynamic characteristics						
Q_{GD}	gate-drain charge	$V_{GS} = 10$ V; $I_D = 75$ A; $V_{DS} = 60$ V; $T_j = 25$ °C; see Figure 11	-	50	-	nC
Static characteristics						
R_{DSon}	drain-source on-state resistance	$V_{GS} = 10$ V; $I_D = 25$ A; $T_j = 25$ °C; see Figure 9 and 10	-	4.3	5	mΩ

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	drain		

SOT404 (D2PAK)

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

3. Ordering information

Table 3. Ordering information

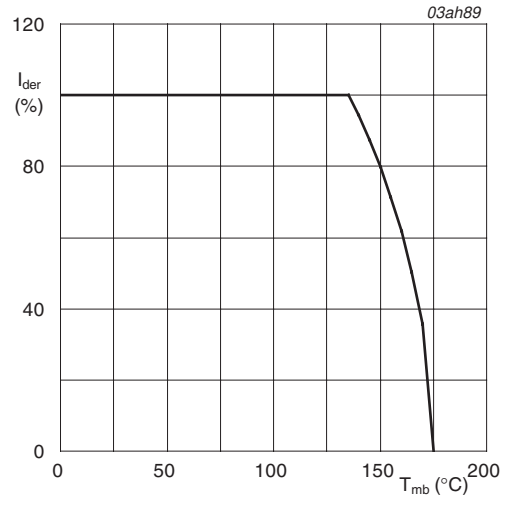
Type number	Package		
	Name	Description	Version
PSMN005-75B	D2PAK	plastic single-ended surface-mounted package (D2PAK); 3 leads (one lead cropped)	SOT404

4. Limiting values

Table 4. Limiting values

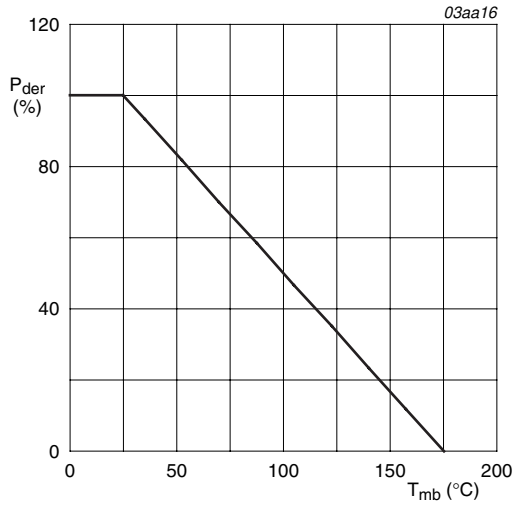
In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions	Min	Max	Unit
V_{DS}	drain-source voltage	$T_j \geq 25$ °C; $T_j \leq 175$ °C	-	75	V
V_{DGR}	drain-gate voltage	$T_j \leq 175$ °C; $T_j \geq 25$ °C; R_{GS} = 20 kΩ	-	75	V
V_{GS}	gate-source voltage		-20	20	V
I_D	drain current	V_{GS} = 10 V; T_{mb} = 100 °C; see Figure 1	-	75	A
		V_{GS} = 10 V; T_{mb} = 25 °C; see Figure 1 and 3	-	75	A
I_{DM}	peak drain current	$t_p \leq 10$ µs; pulsed; T_{mb} = 25 °C; see Figure 3	-	400	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; $t_p \leq 50$ µs; δ 25 %; $T_j \leq 150$ °C	-30	30	V
Source-drain diode					
I_S	source current	T_{mb} = 25 °C	-	75	A
I_{SM}	peak source current	$t_p \leq 10$ µs; pulsed; T_{mb} = 25 °C	-	400	A
Avalanche ruggedness					
$E_{DS(AL)S}$	non-repetitive drain-source avalanche energy	V_{GS} = 10 V; $T_{j(init)}$ = 25 °C; I_D = 75 A; V_{sup} = 15 V; unclamped; t_p = 0.1 ms; R_{GS} = 50 Ω	-	500	mJ
$I_{DS(AL)S}$	non-repetitive drain-source avalanche current	V_{GS} = 10 V; V_{sup} = 15 V; R_{GS} = 50 Ω; $T_{j(init)}$ = 25 °C; unclamped	-	75	A



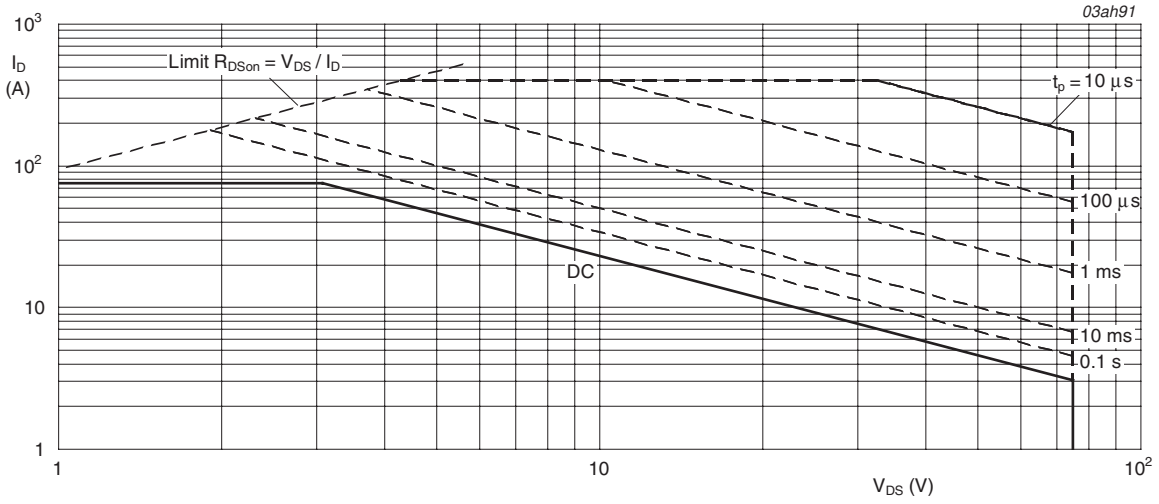
$$I_{der} = \frac{I_D}{I_{D(25°C)}} \times 100\,\%$$

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



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

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



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

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

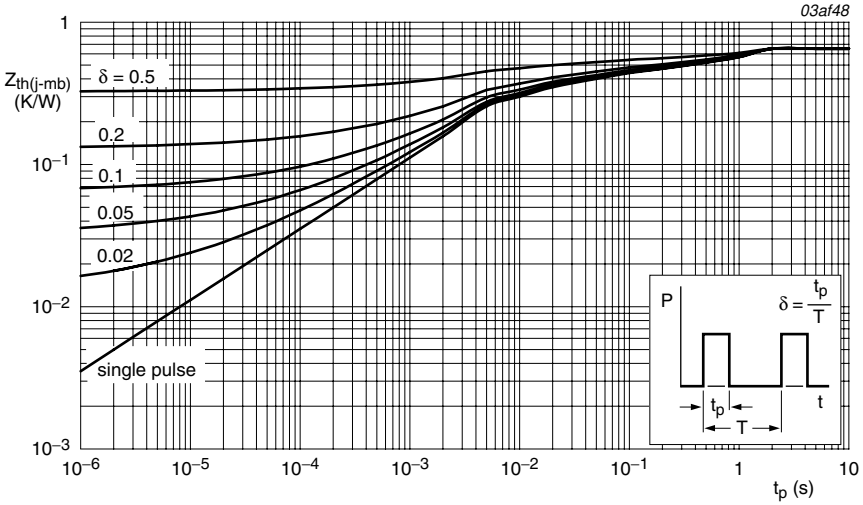
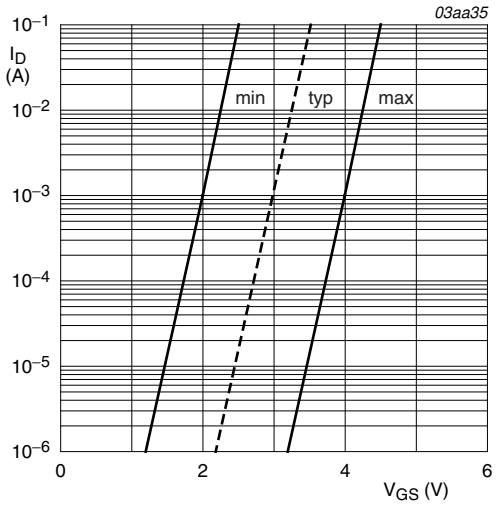


Fig 4. Transient thermal impedance from junction to mounting base as a function of pulse duration

6. Characteristics

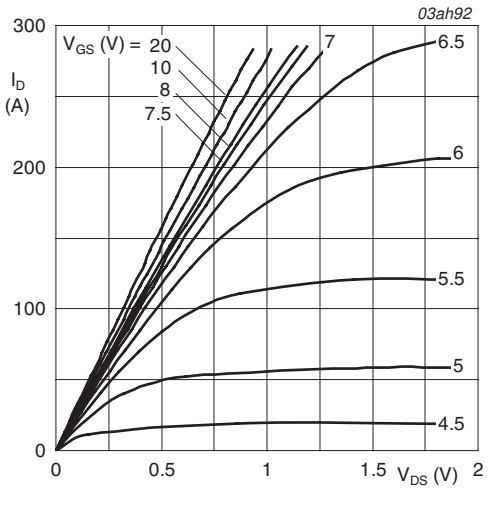
Table 6. Characteristics

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 = -55 °C	67	-	-	V
		I_D = 0.25 mA; V_{GS} = 0 V; T_j = 25 °C	75	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	I_D = 1 mA; V_{DS} = V_{GS}; T_j = 175 °C; see Figure 8	1	-	-	V
		I_D = 1 mA; V_{DS} = V_{GS}; T_j = 25 °C; see Figure 8	2	3	4	V
		I_D = 1 mA; V_{DS} = V_{GS}; T_j = -55 °C; see Figure 8	-	-	4.4	V
I_{DSS}	drain leakage current	V_{DS} = 75 V; V_{GS} = 0 V; T_j = 25 °C	-	0.02	1	µA
		V_{DS} = 75 V; V_{GS} = 0 V; T_j = 175 °C	-	-	500	µA
I_{GSS}	gate leakage current	V_{GS} = 20 V; V_{DS} = 0 V; T_j = 25 °C	-	10	100	nA
		V_{GS} = -20 V; V_{DS} = 0 V; T_j = 25 °C	-	10	100	nA
R_{DSon}	drain-source on-state resistance	V_{GS} = 10 V; I_D = 25 A; T_j = 175 °C; see Figure 9 and 10	-	9.25	10.75	mΩ
		V_{GS} = 10 V; I_D = 25 A; T_j = 25 °C; see Figure 9 and 10	-	4.3	5	mΩ
Dynamic characteristics						
$Q_{G(tot)}$	total gate charge	I_D = 75 A; V_{DS} = 60 V; V_{GS} = 10 V; T_j = 25 °C; see Figure 11	-	165	-	nC
Q_{GS}	gate-source charge		-	32	-	nC
Q_{GD}	gate-drain charge		-	50	-	nC
C_{iss}	input capacitance	V_{DS} = 25 V; V_{GS} = 0 V; f = 1 MHz; T_j = 25 °C; see Figure 12	-	8250	-	pF
C_{oss}	output capacitance		-	920	-	pF
C_{rss}	reverse transfer capacitance		-	470	-	pF
$t_{d(on)}$	turn-on delay time	V_{DS} = 15 V; R_L = 1.25 Ω; V_{GS} = 10 V; $R_{G(ext)}$ = 6 Ω; T_j = 25 °C	-	37	-	ns
t_r	rise time		-	73	-	ns
$t_{d(off)}$	turn-off delay time		-	144	-	ns
t_f	fall time		-	74	-	ns
Source-drain diode						
V_{SD}	source-drain voltage	I_S = 25 A; V_{GS} = 0 V; T_j = 25 °C; see Figure 13	-	0.8	1.2	V



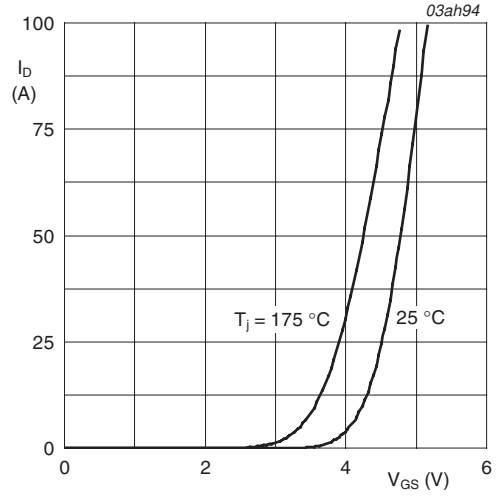
$T_j = 25\,°C; V_{DS} = 5V$

Fig 5. Sub-threshold drain current as a function of gate-source voltage



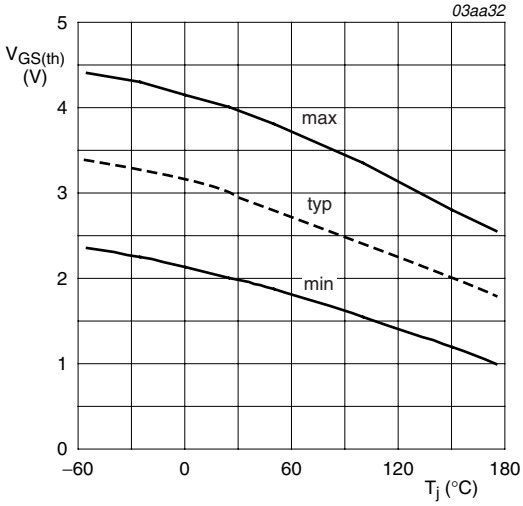
$T_j = 25°C$

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



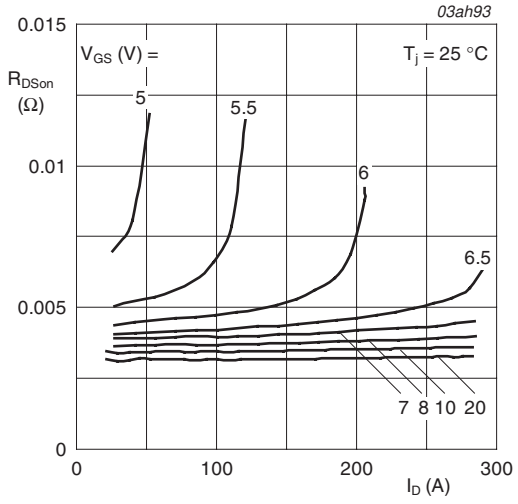
$T_j = 25°C \text{ and } 175°C; V_{DS} > I_D \times R_{DSon}$

Fig 7. Transfer characteristics: drain current as a function of gate-source voltage; typical values



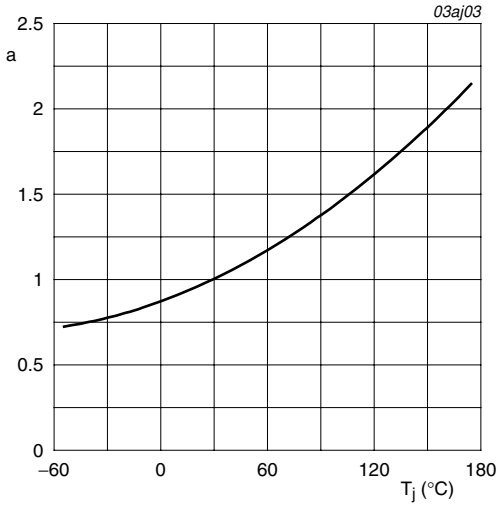
$I_D = 1mA; V_{DS} = V_{GS}$

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



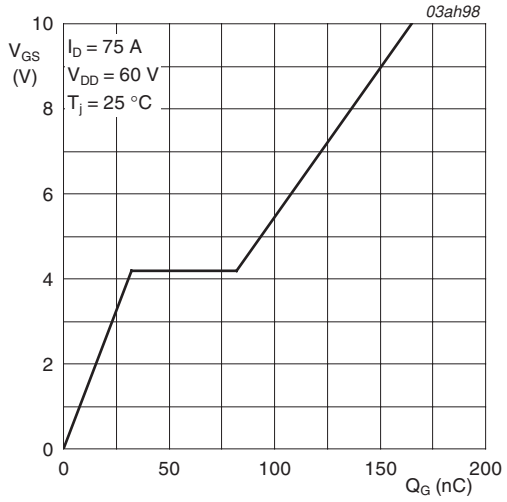
$T_j = 25°C$

Fig 9. Drain-source on-state resistance as a function of drain current; typical values



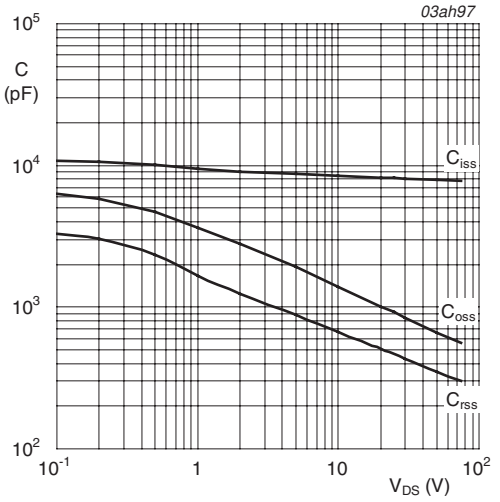
$$a = \frac{R_{DSon}}{R_{DSon(25°C)}}$$

Fig 10. Normalized drain-source on-state resistance factor as a function of junction temperature



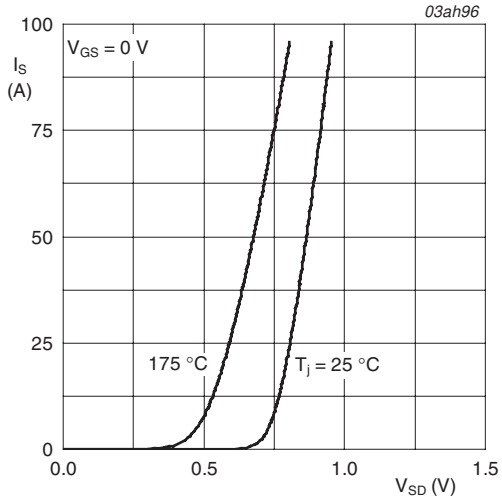
$I_D = 75\ A; V_{DD} = 60\ V; T_j = 25\ °C$

Fig 11. Gate-source voltage as a function of gate charge; typical values



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

Fig 12. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values

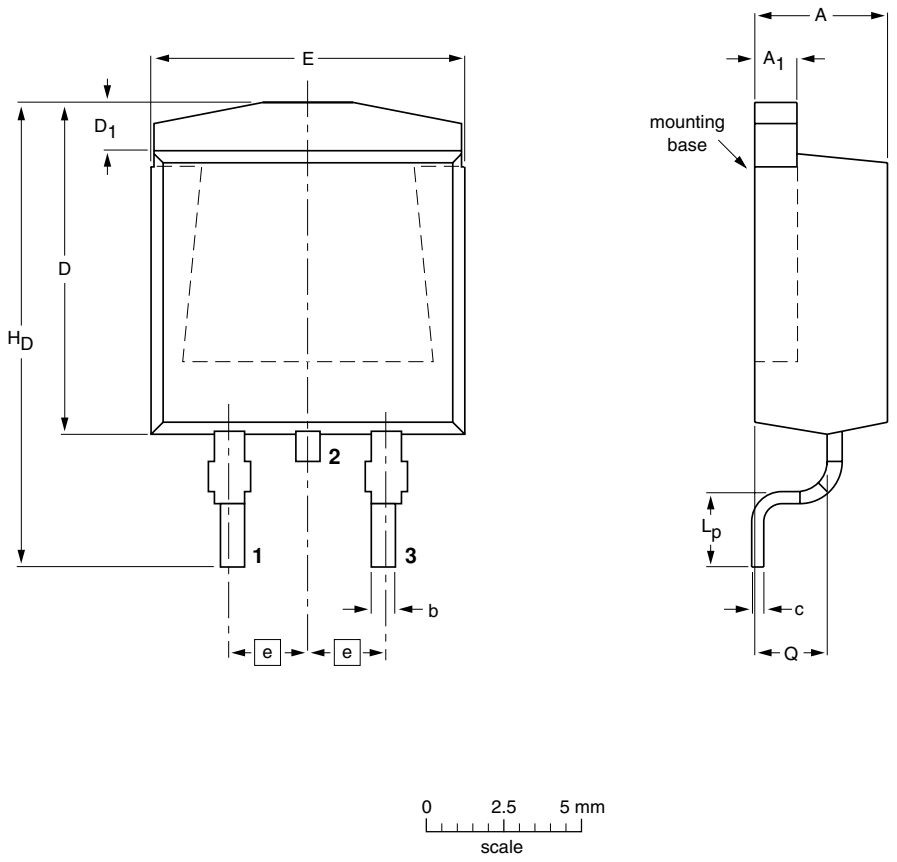


$T_j = 25°C \text{ and } 175°C; V_{GS} = 0V$

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**



DIMENSIONS (mm are the original dimensions)

UNIT	A	A_1	b	c	D max.	D_1	E	e	L_p	H_D	Q
mm	4.50 4.10	1.40 1.27	0.85 0.60	0.64 0.46	11	1.60 1.20	10.30 9.70	2.54	2.90 2.10	15.80 14.80	2.60 2.20

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT404						~~05-02-11~~ 06-03-16

Fig 14. Package outline SOT404 (D2PAK)

8. Revision history

Table 7. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
PSMN005-75B_1	20091116	Product data sheet	-	-

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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