



PSMN015-100P

N-channel TrenchMOS SiliconMAX standard level FET

Rev. 06 — 17 December 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
- Rated for avalanche ruggedness

1.3 Applications

- DC-to-DC convertors
- Switched-mode power supplies

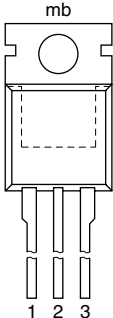
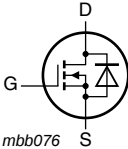
1.4 Quick reference data

Table 1. Quick reference

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{DS}	drain-source voltage	$T_j \geq 25\text{ °C}$; $T_j \leq 175\text{ °C}$	-	-	100	V
I_D	drain current	$T_{mb} = 25\text{ °C}$; $V_{GS} = 10\text{ V}$; see Figure 1 and 3	-	-	75	A
P_{tot}	total power dissipation	$T_{mb} = 25\text{ °C}$; see Figure 2	-	-	300	W
Dynamic characteristics						
Q_{GD}	gate-drain charge	$V_{GS} = 10\text{ V}$; $I_D = 75\text{ A}$; $V_{DS} = 80\text{ V}$; $T_j = 25\text{ °C}$; see Figure 11	-	35	-	nC
Static characteristics						
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = 10\text{ V}$; $I_D = 25\text{ A}$; $T_j = 25\text{ °C}$; see Figure 9 and 10	-	12	15	mΩ

2. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	G	gate		
2	D	drain		
3	S	source		
mb	D	mounting base; connected to drain		
			SOT78 (TO-220AB)	

3. Ordering information

Table 3. Ordering information

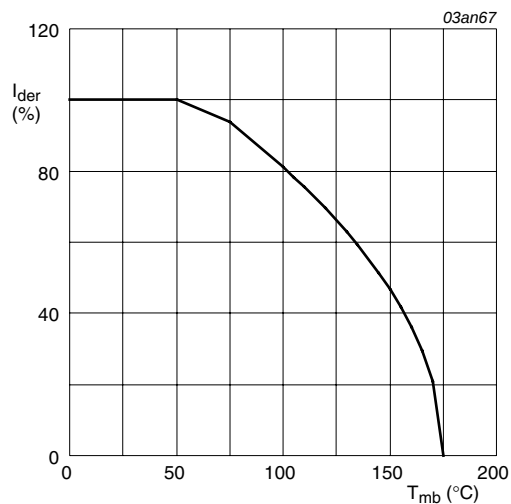
Type number	Package		
	Name	Description	Version
PSMN015-100P	TO-220AB	plastic single-ended package; heatsink mounted; 1 mounting hole; 3-lead TO-220AB	SOT78

4. Limiting values

Table 4. Limiting values

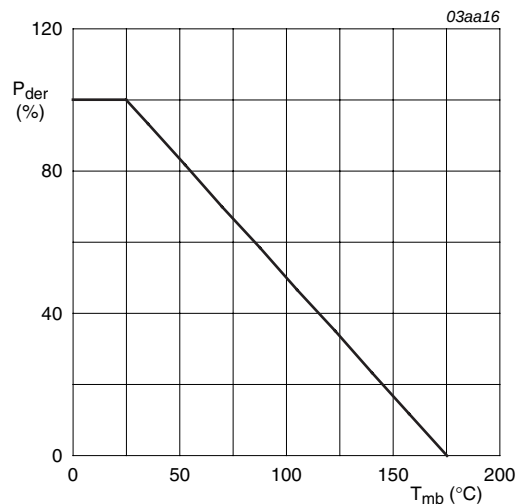
In accordance with the Absolute Maximum Rating System (IEC 60134).

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 Figure 1	-	60.8	A
		$V_{GS} = 10\text{ V}$; $T_{mb} = 25\text{ °C}$; see Figure 1 and 3	-	75	A
I_{DM}	peak drain current	$t_p \leq 10\text{ }\mu\text{s}$; pulsed; $T_{mb} = 25\text{ °C}$; see Figure 3	-	240	A
P_{tot}	total power dissipation	$T_{mb} = 25\text{ °C}$; see Figure 2	-	300	W
T_{stg}	storage temperature		-55	175	°C
T_j	junction temperature		-55	175	°C
Source-drain diode					
I_S	source current	$T_{mb} = 25\text{ °C}$	-	75	A
I_{SM}	peak source current	$t_p \leq 10\text{ }\mu\text{s}$; pulsed; $T_{mb} = 25\text{ °C}$	-	240	A
Avalanche ruggedness					
$E_{DS(AL)S}$	non-repetitive drain-source avalanche energy	$V_{GS} = 10\text{ V}$; $T_{j(init)} = 25\text{ °C}$; $I_D = 36\text{ A}$; $V_{sup} \leq 50\text{ V}$; unclamped; $t_p = 0.11\text{ ms}$; $R_{GS} = 50\text{ }\Omega$	-	320	mJ



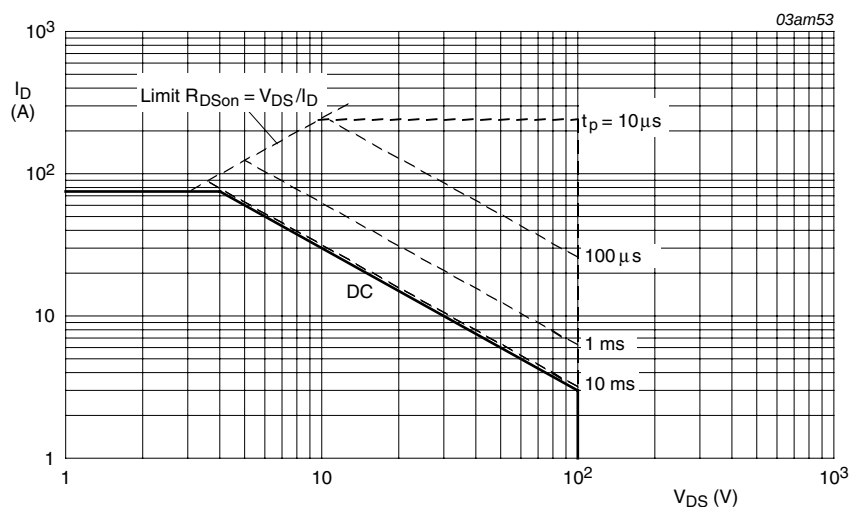
$$I_{der} = \frac{I_D}{I_{D(25^\circ\text{C})}} \times 100\%$$

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



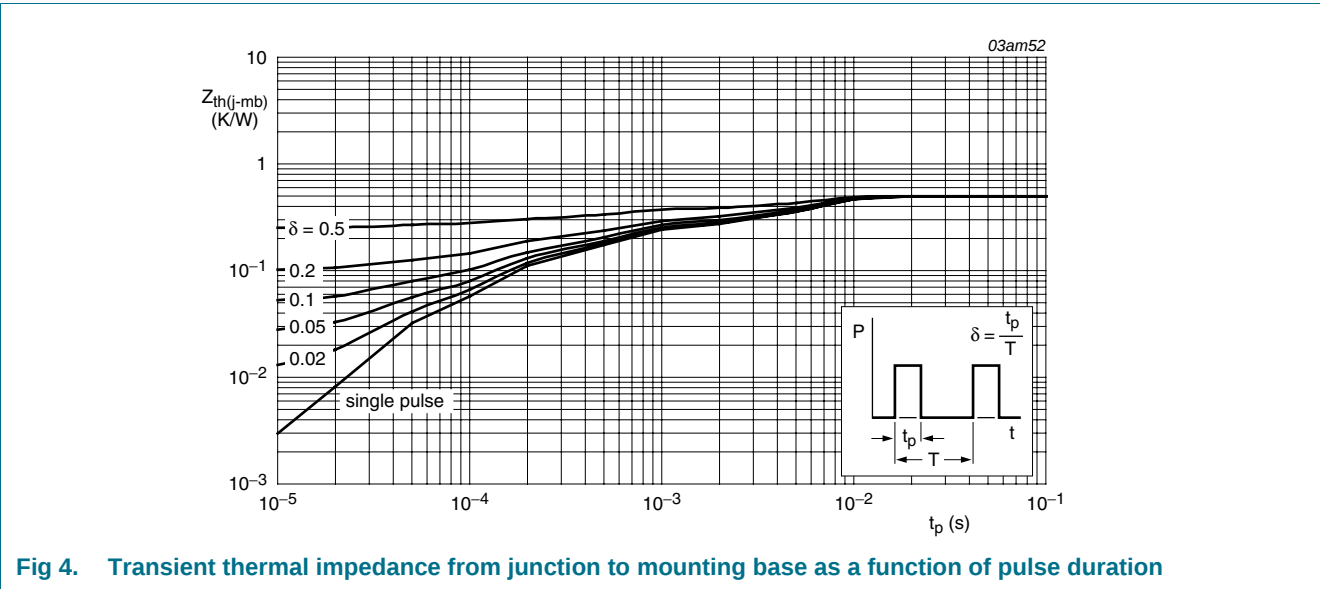
$$T_{mb} = 25^\circ\text{C}; I_{DM} \text{ is single pulse}; V_{GS} = 10\text{V}$$

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

5. Thermal characteristics

Table 5. Thermal characteristics

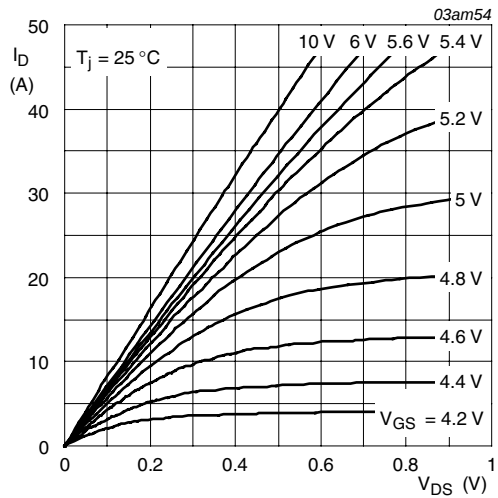
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$R_{th(j-mb)}$	thermal resistance from junction to mounting base	see Figure 4	-	-	0.5	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient	vertical in still air	-	60	-	K/W



6. Characteristics

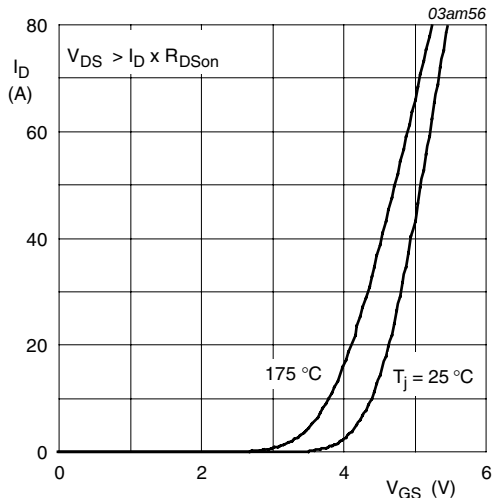
Table 6. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static characteristics						
V _{(BR)DSS}	drain-source breakdown voltage	I _D = 250 μA; V _{GS} = 0 V; T _j = -55 °C	89	-	-	V
		I _D = 250 μA; V _{GS} = 0 V; T _j = 25 °C	100	-	-	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 = -55 °C; see Figure 8	-	-	4.4	V
		I _D = 1 mA; V _{DS} = V _{GS} ; T _j = 25 °C; see Figure 8	2	3	4	V
I _{DSS}	drain leakage current	V _{DS} = 100 V; V _{GS} = 0 V; T _j = 25 °C	-	0.05	10	μA
		V _{DS} = 100 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; see Figure 9	-	2	100	nA
		V _{GS} = -20 V; V _{DS} = 0 V; T _j = 25 °C; see Figure 9	-	2	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	-	32.4	40.5	mΩ
		V _{GS} = 10 V; I _D = 25 A; T _j = 25 °C; see Figure 9 and 10	-	12	15	mΩ
Dynamic characteristics						
Q _{G(tot)}	total gate charge	I _D = 75 A; V _{DS} = 80 V; V _{GS} = 10 V; T _j = 25 °C; see Figure 11	-	90	-	nC
Q _{GS}	gate-source charge	I _D = 75 A; V _{DS} = 80 V; V _{GS} = 10 V; see Figure 11	-	20	-	nC
Q _{GD}	gate-drain charge	I _D = 75 A; V _{DS} = 80 V; V _{GS} = 10 V; T _j = 25 °C; see Figure 11	-	35	-	nC
C _{iss}	input capacitance	V _{DS} = 25 V; V _{GS} = 0 V; f = 1 MHz; T _j = 25 °C; see Figure 12	-	4900	-	pF
C _{oss}	output capacitance		-	390	-	pF
C _{rss}	reverse transfer capacitance		-	220	-	pF
t _{d(on)}	turn-on delay time	V _{DS} = 50 V; R _L = 1.8 Ω; V _{GS} = 10 V; R _{G(ext)} = 5.6 Ω; T _j = 25 °C	-	25	-	ns
t _r	rise time		-	65	-	ns
t _{d(off)}	turn-off delay time		-	95	-	ns
t _f	fall time		-	50	-	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	1.1	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	-	80	-	ns
Q _r	recovered charge	V _{DS} = 25 V; T _j = 25 °C	-	115	-	nC



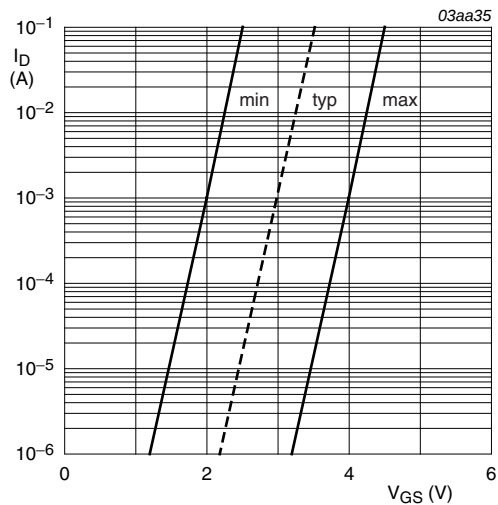
$T_j = 25\text{ }^{\circ}\text{C}$

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



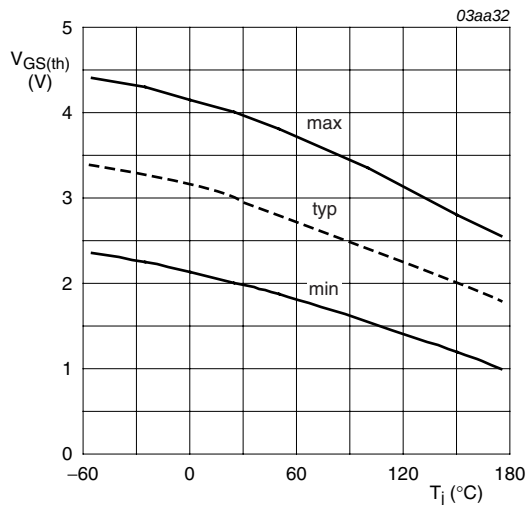
$T_j = 25\text{ }^{\circ}\text{C}$ and $175\text{ }^{\circ}\text{C}; V_{DS} > I_D \times R_{DSon}$

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



$T_j = 25\text{ }^{\circ}\text{C}; V_{DS} = 5\text{ V}$

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

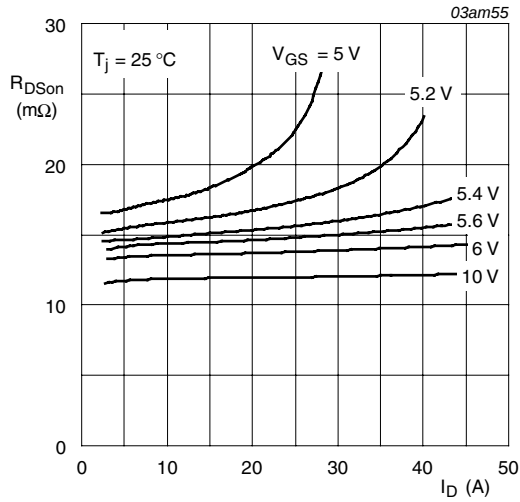
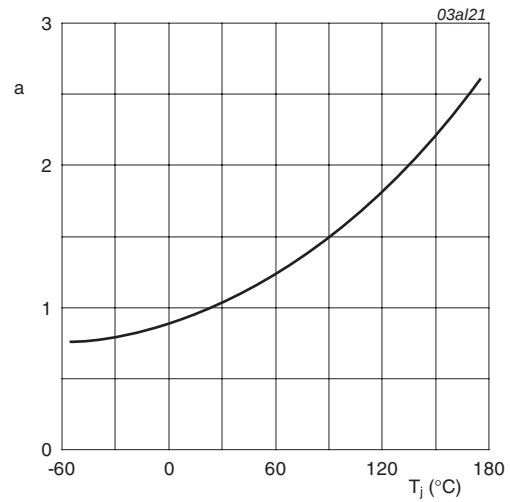

 $T_j = 25\text{ °C}$

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



$$a = \frac{R_{DS(on)}}{R_{DS(on)(25\text{ °C})}}$$

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

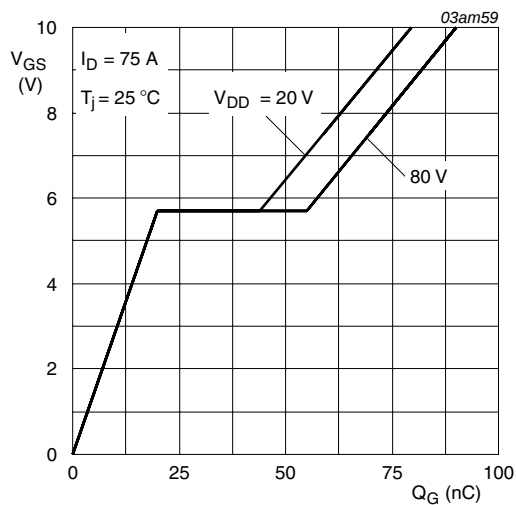

 $I_D = 75\text{ A}; T_j = 25\text{ °C}$

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

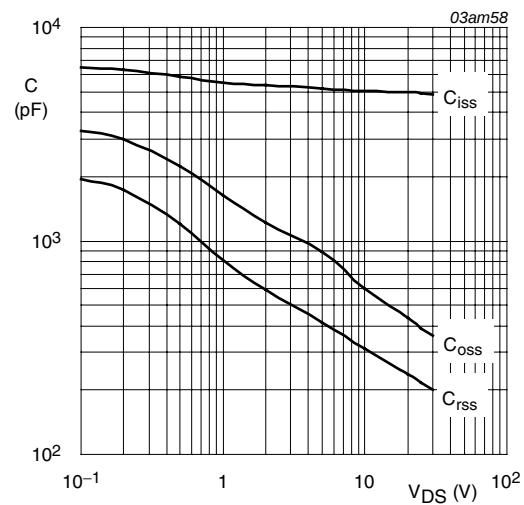
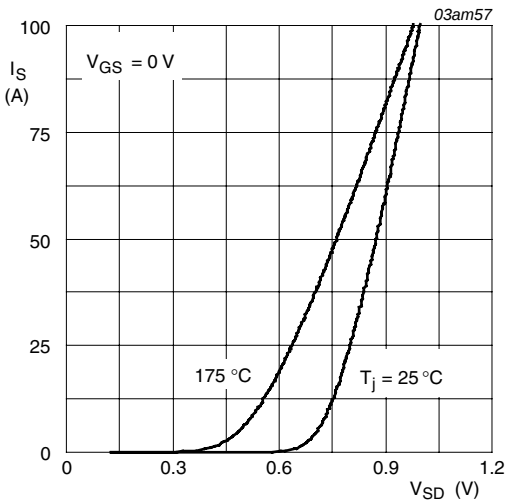

 $V_{GS} = 0\text{ V}; f = 1\text{ MHz}$

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



$T_J = 25^\circ\text{C}$ 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 package; heatsink mounted; 1 mounting hole; 3-lead TO-220AB SOT78

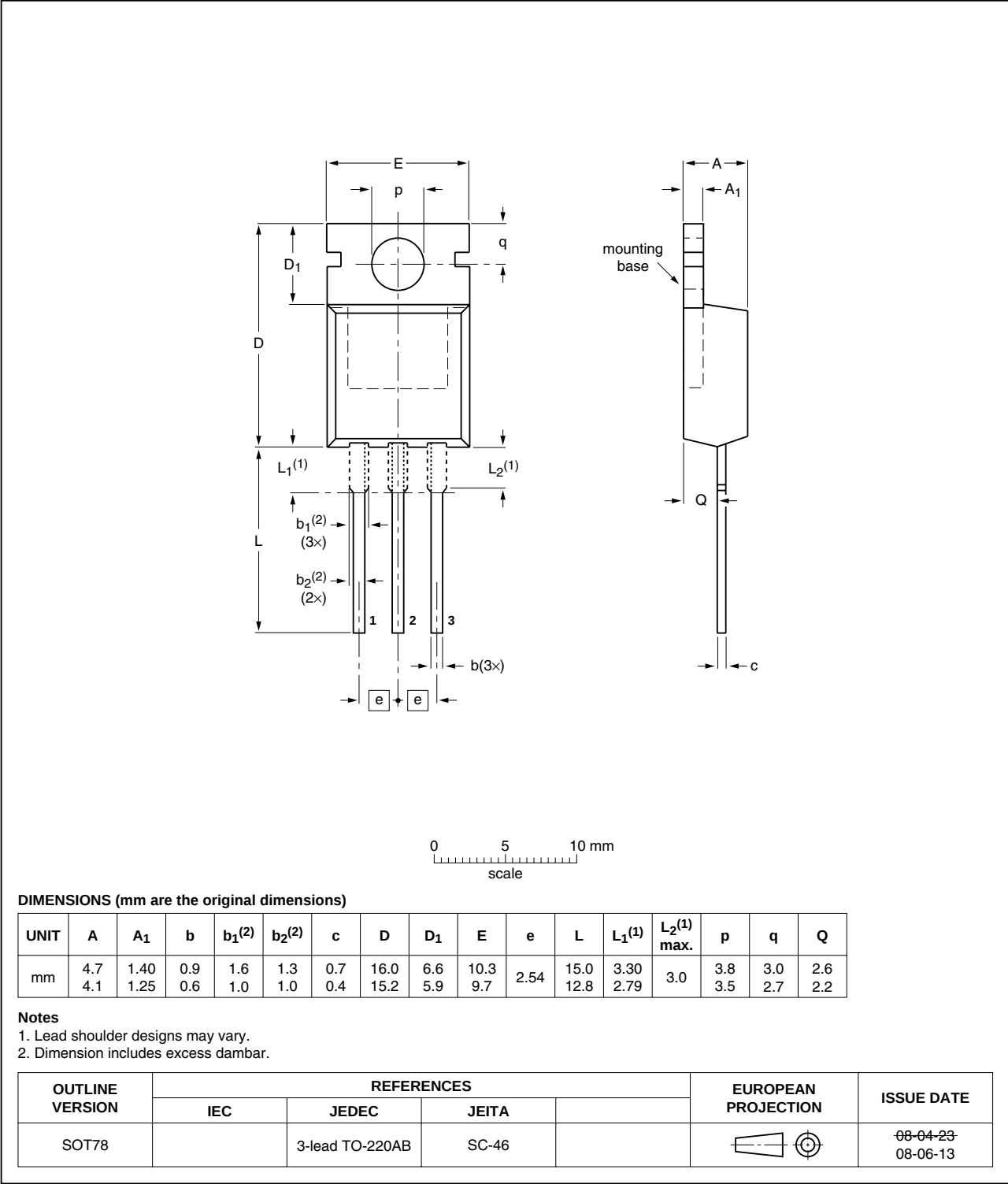


Fig 14. Package outline SOT78 (TO-220AB)

8. Revision history

Table 7. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
PSMN015-100P_6	20091217	Product data sheet	-	PSMN015_100P_100B-05
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 PSMN015-100P separated from data sheet PSMN015_100P_100B-05.			
PSMN015_100P_100B-05	20040114	Product data	-	PSMN015-100_SERIES_4
PSMN015-100_SERIES_4	20030601	Product specification	-	PSMN015-100_SERIES_HG_3
PSMN015-100_SERIES_HG_3	20000328	Product specification	-	PSMN015-100_SERIES_2
PSMN015-100_SERIES_2	19990801	Product specification	-	PSMN015-100_SERIES_1
PSMN015-100_SERIES_1	19990201	Product specification	-	-

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".

[3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the Internet at URL <http://www.nexperia.com>.

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11. Contents

1 **Product profile1**

1.1 General description1

1.2 Features and benefits1

1.3 Applications1

1.4 Quick reference data1

2 **Pinning information2**

3 **Ordering information2**

4 **Limiting values2**

5 **Thermal characteristics4**

6 **Characteristics5**

7 **Package outline9**

8 **Revision history10**

9 **Legal information11**

9.1 Data sheet status11

9.2 Definitions11

9.3 Disclaimers11

9.4 Trademarks11

10 **Contact information11**