

SI4884

TrenchMOS™ logic level FET

Rev. 02 — 12 April 2002

Product data

1. Product profile

1.1 Description

N-channel enhancement mode field-effect transistor in a plastic package using TrenchMOS™ technology.

Product availability:

SI4884 in SOT96-1 (SO8).

1.2 Features

- Low on-state resistance
- Fast switching.

1.3 Applications

- DC to DC converters
- Portable equipment applications.

1.4 Quick reference data

- $V_{DS} = 30\text{ V}$
- $I_D = 12\text{ A}$
- $P_{tot} = 2.5\text{ W}$
- $R_{DS(on)} = 16.5\text{ m}\Omega$.

2. Pinning information

Table 1: Pinning - SOT96-1, simplified outline and symbol

Pin	Description	Simplified outline	Symbol
1,2,3	source (s)	<p style="text-align: center;">Top view MBK187</p>	<p style="text-align: center;">MBB076</p>
4	gate (g)		
5,6,7,8	drain (d)		

SOT96-1 (SO8)



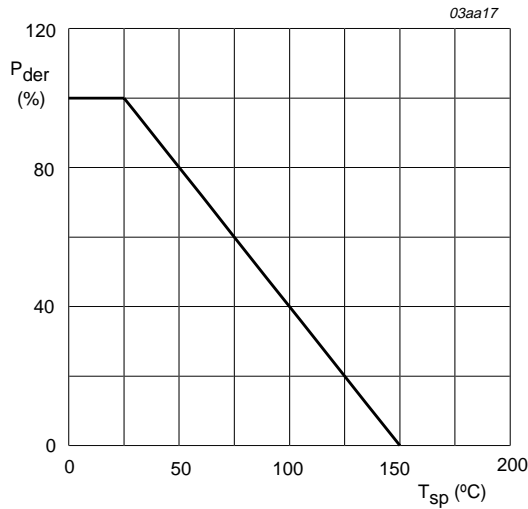
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3. Limiting values

Table 2: Limiting values

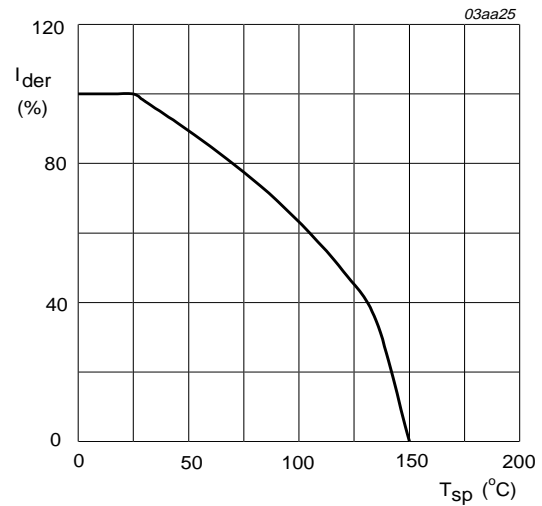
In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions	Min	Max	Unit
V_{DS}	drain-source voltage (DC)	$T_j = 25$ to 150 °C	-	30	V
V_{GS}	gate-source voltage		-	± 20	V
I_D	drain current	$T_{sp} = 25$ °C; Figure 2 and 3	-	12	A
I_{DM}	peak drain current	$T_{sp} = 25$ °C; pulsed; Figure 3	-	45	A
P_{tot}	total power dissipation	$T_{sp} = 25$ °C; Figure 1	-	2.5	W
T_{stg}	storage temperature		-55	+150	°C
T_j	junction temperature		-55	+150	°C
Source-drain diode					
I_S	source (diode forward) current	$T_{sp} = 25$ °C	-	12	A



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

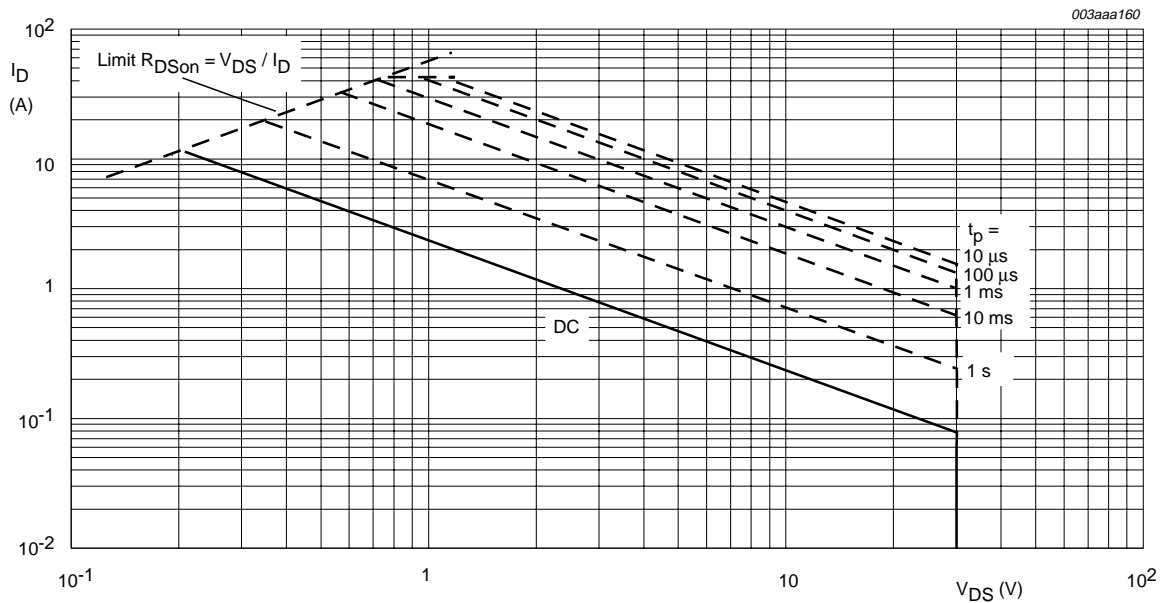
Fig 1. Normalized total power dissipation as a function of solder point temperature.



$V_{GS} \geq 5\text{ V}$

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

Fig 2. Normalized continuous drain current as a function of solder point temperature.



$T_{sp} = 25^{\circ}C$; I_{DM} is single pulse

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

4. Thermal characteristics

Table 3: Thermal characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$R_{th(j-a)}$	thermal resistance from junction to ambient	mounted on a printed circuit board; $t_p \leq 10$ s; minimum footprint; Figure 4	-	60	-	K/W

4.1 Transient thermal impedance

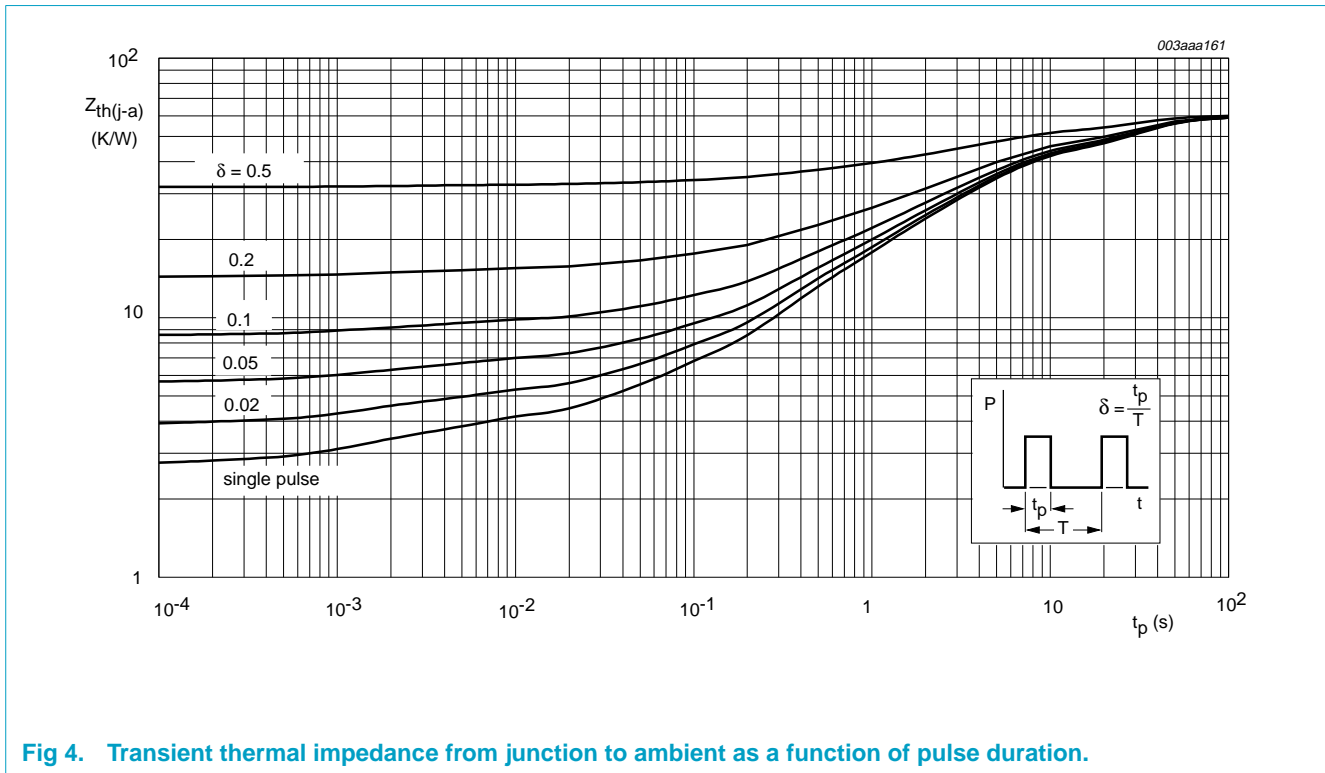


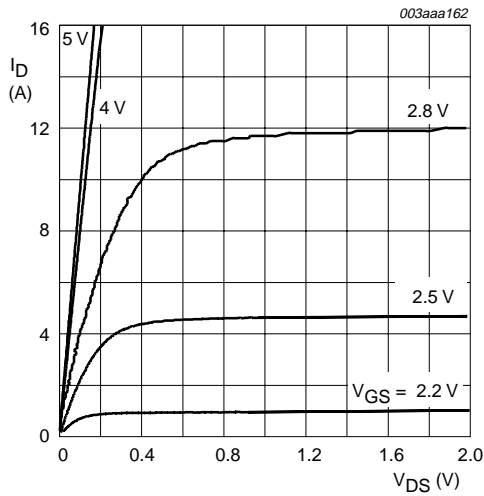
Fig 4. Transient thermal impedance from junction to ambient as a function of pulse duration.

5. Characteristics

Table 4: Characteristics

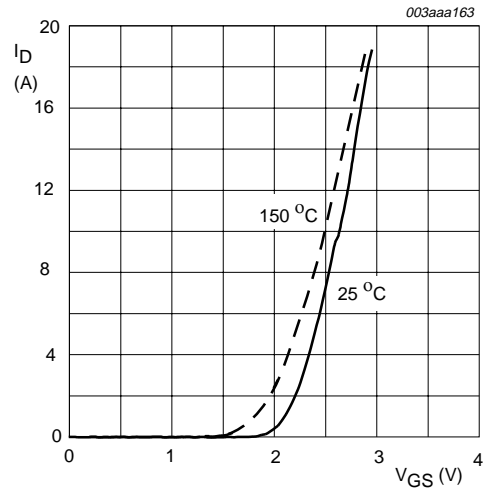
$T_j = 25\text{ °C}$ unless otherwise specified

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static characteristics						
$V_{(BR)DSS}$	drain-source breakdown voltage	$I_D = 250\ \mu\text{A}; V_{GS} = 0\ \text{V}$	30	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	$I_D = 250\ \mu\text{A}; V_{DS} = V_{GS}$; Figure 9	1	-	2	V
I_{DSS}	drain-source leakage current	$V_{DS} = 24\ \text{V}; V_{GS} = 0\ \text{V}$ $T_j = 25\text{ °C}$	-	-	1	μA
			-	-	5	μA
			-	-	-	-
I_{GSS}	gate-source leakage current	$V_{GS} = \pm 20\ \text{V}; V_{DS} = 0\ \text{V}$	-	-	100	nA
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = 4.5\ \text{V}; I_D = 10\ \text{A}$; Figure 7 and 8	-	11	16.5	$\text{m}\Omega$
		$V_{GS} = 10\ \text{V}; I_D = 12\ \text{A}$;	-	8.9	10.5	$\text{m}\Omega$
Dynamic characteristics						
g_{fs}	forward transconductance	$V_{DS} = 15\ \text{V}; I_D = 10\ \text{A}$;	-	34	-	S
$Q_{g(tot)}$	total gate charge	$I_D = 15\ \text{A}; V_{DD} = 16\ \text{V}; V_{GS} = 5\ \text{V}$; Figure 13	-	17.6	-	nC
Q_{gs}	gate-source charge		-	4	-	nC
Q_{gd}	gate-drain (Miller) charge		-	4.4	-	nC
C_{iss}	input capacitance	$V_{GS} = 0\ \text{V}; V_{DS} = 16\ \text{V}; f = 1\ \text{MHz}$; Figure 11	-	1335	-	pF
C_{oss}	output capacitance		-	391	-	pF
C_{rss}	reverse transfer capacitance		-	190	-	pF
$t_{d(on)}$	turn-on delay time	$V_{DD} = 16\ \text{V}; R_D = 10\ \Omega; V_{GS} = 10\ \text{V}$	-	10.6	-	ns
t_r	rise time		-	11.7	-	ns
$t_{d(off)}$	turn-off delay time		-	37	-	ns
t_f	fall time		-	19	-	ns
Source-drain (reverse) diode						
V_{SD}	source-drain (diode forward) voltage	$I_S = 1\ \text{A}; V_{GS} = 0\ \text{V}$; Figure 12	-	0.7	1.0	V
t_{rr}	reverse recovery time	$I_S = 2.3\ \text{A}; dI_S/dt = -100\ \text{A}/\mu\text{s}; V_{GS} = 0\ \text{V}$	-	70	-	ns



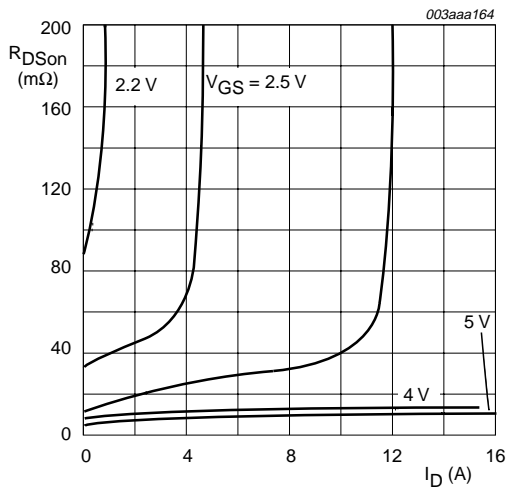
$T_j = 25\text{ }^\circ\text{C}$

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



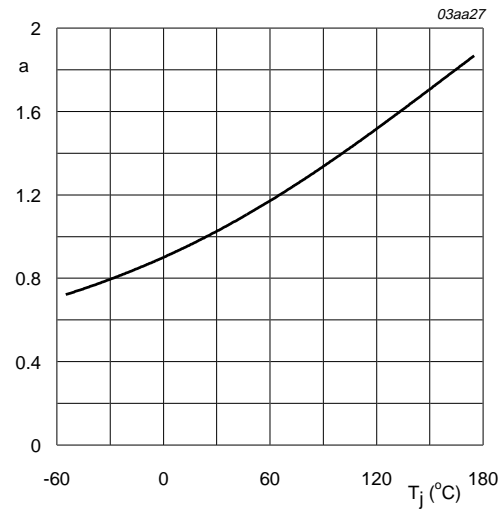
$T_j = 25\text{ }^\circ\text{C}$ and $150\text{ }^\circ\text{C}$; $V_{DS} > I_D \times R_{DSon}$

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



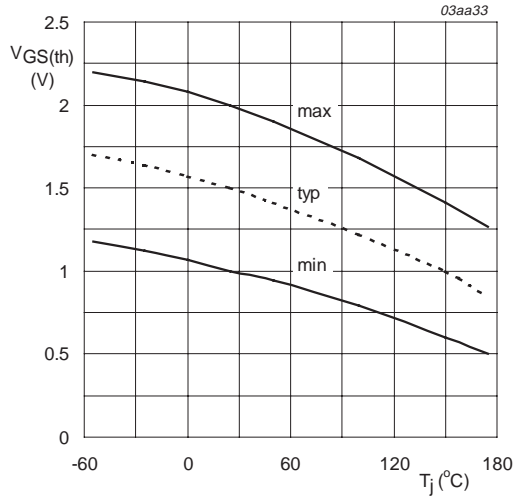
$T_j = 25\text{ }^\circ\text{C}$

Fig 7. Drain-source on-state resistance as a function of drain current; typical values.



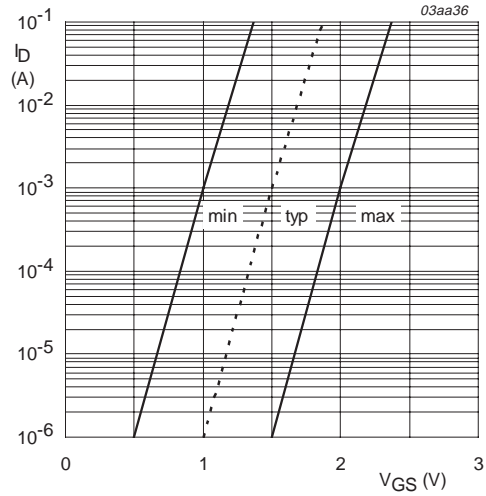
$$a = \frac{R_{DSon}}{R_{DSon(25^\circ\text{C})}}$$

Fig 8. Normalized drain source on-state resistance factor as a function of junction temperature.



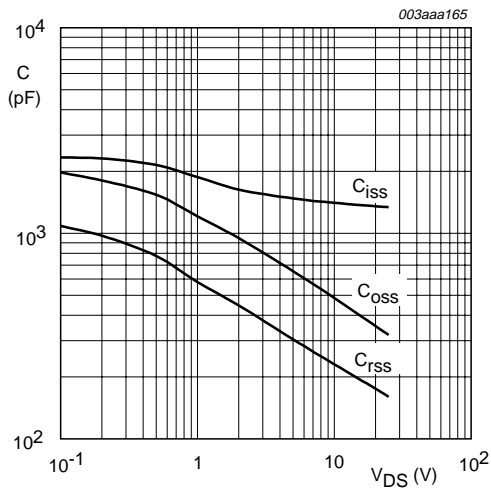
$I_D = 1 \text{ mA}; V_{DS} = V_{GS}$

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



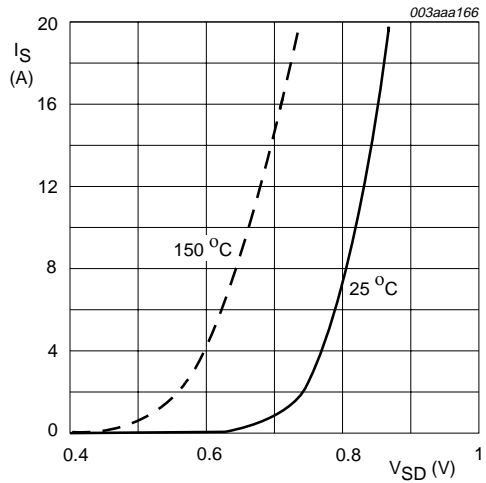
$T_j = 25 \text{ }^\circ\text{C}; V_{DS} = 5 \text{ V}$

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



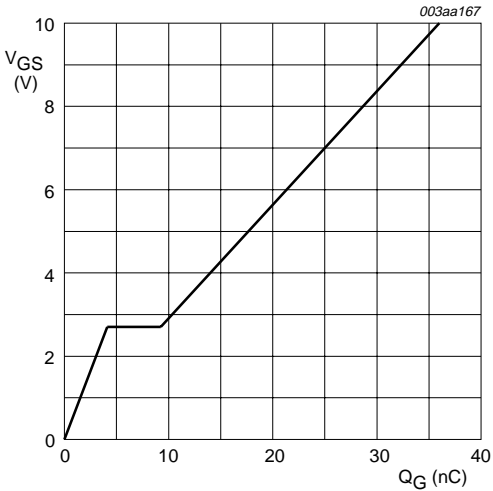
$V_{GS} = 0 \text{ V}; f = 1 \text{ MHz}$

Fig 11. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values.



$T_j = 25 \text{ }^\circ\text{C} \text{ and } 150 \text{ }^\circ\text{C}; V_{GS} = 0 \text{ V}$

Fig 12. Source (diode forward) current as a function of source-drain (diode forward) voltage; typical values.



$I_D = 15\text{ A}; V_{DD} = 16\text{ V}$

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

6. Package outline

SOT96-1: plastic small outline package; 8 leads; body width 3.9 mm

SOT96-1

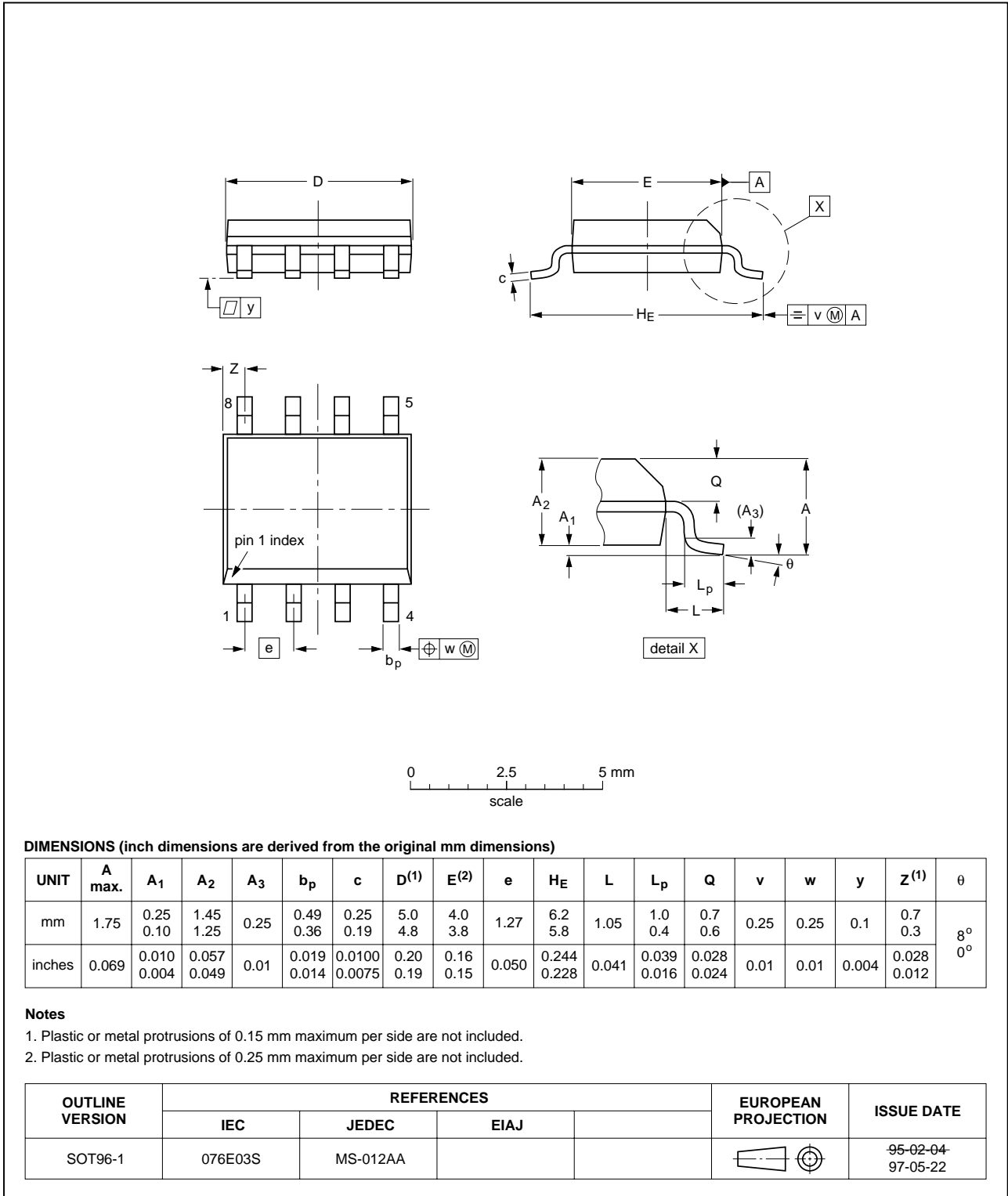


Fig 14. SOT96-1 (S08).

7. Revision history

Table 5: Revision history

Rev	Date	CPCN	Description
02	20020412	-	Product data; version 02. Supersedes data of 15 March 2002. Figure 3 t_p label error corrected.
01	20020315	-	Product data; initial version

8. Data sheet status

Data sheet status ^[1]	Product status ^[2]	Definition
Objective data	Development	This data sheet contains data from the objective specification for product development. Philips Semiconductors reserves the right to change the specification in any manner without notice.
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