

PMN45EN

TrenchMOS™ enhanced logic level FET

Rev. 01 — 27 September 2002

Product data

1. Description

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

Product availability:

PMN45EN in SOT457 (TSOP6).

2. Features

- TrenchMOS™ technology
- Very fast switching
- Low threshold voltage
- Surface mount package.

3. Applications

- Battery powered motor control
- Load switch in notebook computers
- High speed switch in set top box power supplies
- Driver FET in DC to DC converters.

4. Pinning information

Table 1: Pinning - SOT457 (TSOP6), simplified outline and symbol

Pin	Description	Simplified outline	Symbol
1,2,5,6	drain (d)	Top view MBK092 SOT457 (TSOP6)	MBB076
3	gate (g)		
4	source (s)		



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5. Quick reference data

Table 2: Quick reference data

Symbol	Parameter	Conditions	Typ	Max	Unit
V_{DS}	drain-source voltage (DC)	$25\text{ °C} \leq T_j \leq 150\text{ °C}$	-	30	V
I_D	drain current (DC)	$T_{sp} = 25\text{ °C}; V_{GS} = 10\text{ V}$	-	5.2	A
P_{tot}	total power dissipation	$T_{sp} = 25\text{ °C}$	-	1.75	W
T_j	junction temperature		-	150	°C
R_{DSon}	drain-source on-state resistance	$V_{GS} = 10\text{ V}; I_D = 3\text{ A}; T_j = 25\text{ °C}$	32	40	mΩ
		$V_{GS} = 4.5\text{ V}; I_D = 2.8\text{ A}; T_j = 25\text{ °C}$	42	50	mΩ

6. Limiting values

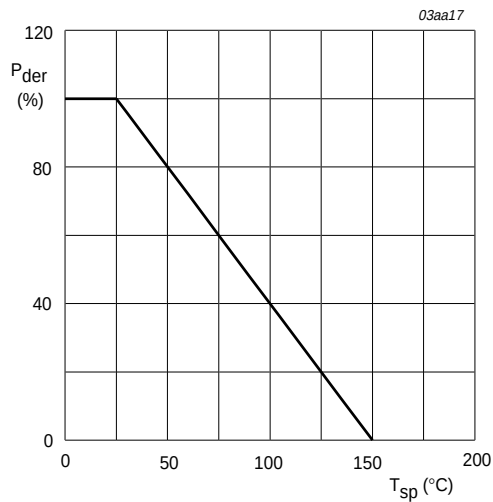
Table 3: Limiting values

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

Symbol	Parameter	Conditions	Min	Max	Unit
V_{DS}	drain-source voltage (DC)	$25\text{ °C} \leq T_j \leq 150\text{ °C}$	-	30	V
V_{GS}	gate-source voltage (DC)		-	20	V
I_D	drain current (DC)	$T_{sp} = 25\text{ °C}; V_{GS} = 10\text{ V}$	-	5.2	A
		$T_{sp} = 70\text{ °C}; V_{GS} = 10\text{ V}$	-	4.2	A
I_{DM}	peak drain current	$T_{sp} = 25\text{ °C}; \text{pulsed}; t_p \leq 10\text{ }\mu\text{s}$	-	21.1	A
P_{tot}	total power dissipation	$T_{sp} = 25\text{ °C}$	-	1.75	W
T_{stg}	storage temperature		-55	+150	°C
T_j	junction temperature		-55	+150	°C

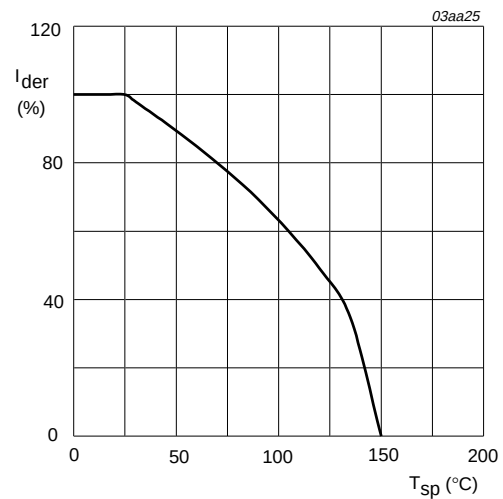
Source-drain diode

I_S	source (diode forward) current (DC)	$T_{sp} = 25\text{ °C}$	-	1.45	A
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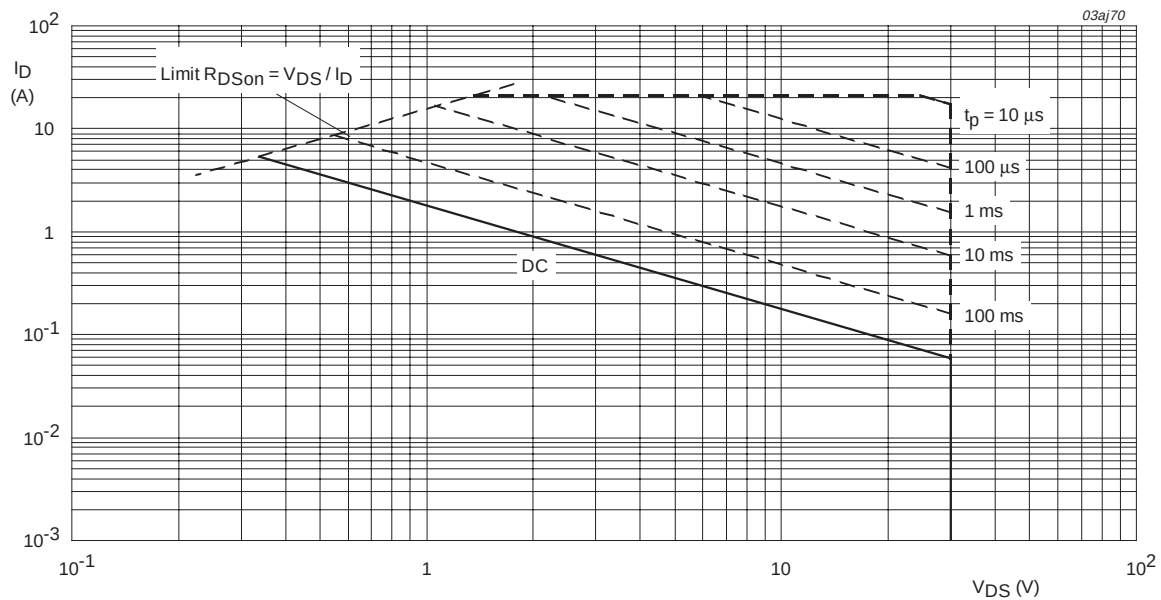
$$P_{der} = \frac{P_{tot}}{P_{tot(25^{\circ}\text{C})}} \times 100\%$$

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



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

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



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

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

7. Thermal characteristics

Table 4: Thermal characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$R_{th(j-sp)}$	thermal resistance from junction to solder point	mounted on a metal clad board; Figure 4	-	-	70	K/W

7.1 Transient thermal impedance

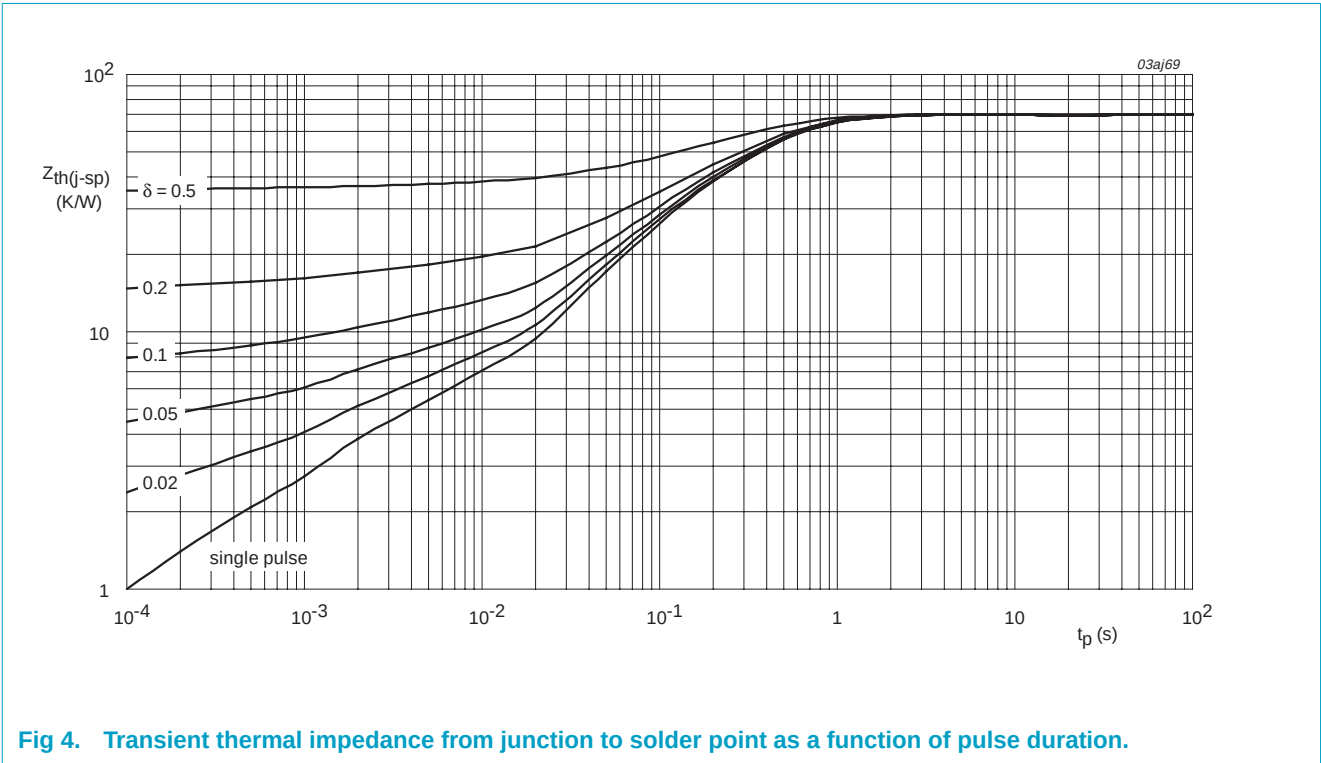


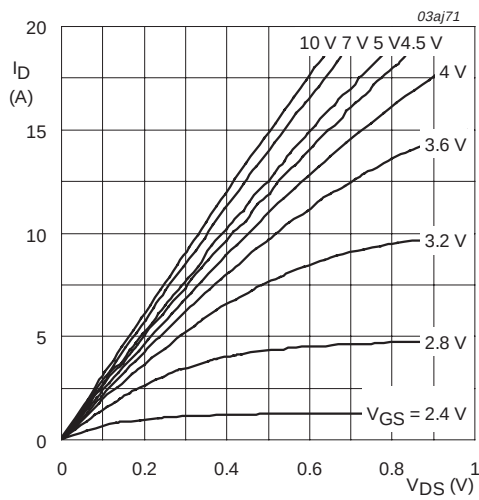
Fig 4. Transient thermal impedance from junction to solder point as a function of pulse duration.

8. Characteristics

Table 5: Characteristics

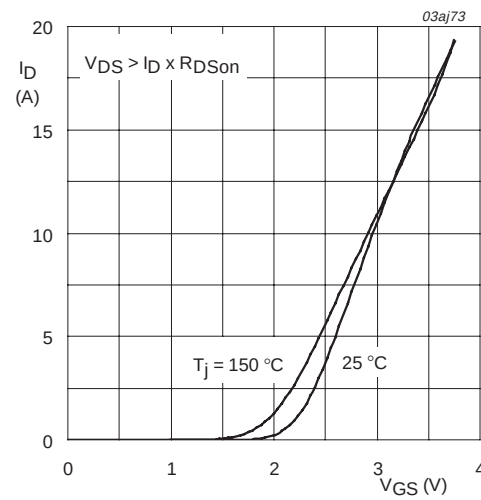
$T_j = 25\text{ }^{\circ}\text{C}$ unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static characteristics						
V _{(BR)DSS}	drain-source breakdown voltage	I _D = 250 μA; V _{GS} = 0 V	30	-	-	V
V _{GS(th)}	gate-source threshold voltage	I _D = 1 mA; V _{DS} = V _{GS}	1	1.5	2	V
I _{DSS}	drain-source leakage current	V _{DS} = 30 V; V _{GS} = 0 V	-	0.01	1.0	μA
I _{GSS}	gate-source leakage current	V _{GS} = ±20 V; V _{DS} = 0 V	-	10	100	nA
R _{DSon}	drain-source on-state resistance	V _{GS} = 10 V; I _D = 3 A; Figure 7 and 8	-	32	40	mΩ
		V _{GS} = 4.5 V; I _D = 2.8 A; Figure 7 and 8	-	42	50	mΩ
Dynamic characteristics						
Q _{g(tot)}	total gate charge	V _{DD} = 15 V; V _{GS} = 4.5 V; I _D = 5 A; Figure 13	-	6.1	-	nC
Q _{gs}	gate-source charge		-	1.7	-	nC
Q _{gd}	gate-drain (Miller) charge		-	2.35	-	nC
C _{iss}	input capacitance	V _{GS} = 0 V; V _{DS} = 25 V; f = 1 MHz; Figure 11	-	495	-	pF
C _{oss}	output capacitance		-	100	-	pF
C _{rss}	reverse transfer capacitance		-	70	-	pF
t _{d(on)}	turn-on delay time	V _{DD} = 15 V; R _D = 12 Ω; V _{GS} = 4.5 V; R _G = 6 Ω	-	14	-	ns
t _r	rise time		-	19	-	ns
t _{d(off)}	turn-off delay time		-	28	-	ns
t _f	fall time		-	16	-	ns
Source-drain diode						
V _{SD}	source-drain (diode forward) voltage	I _S = 1.7 A; V _{GS} = 0 V; Figure 12	-	0.75	1.2	V



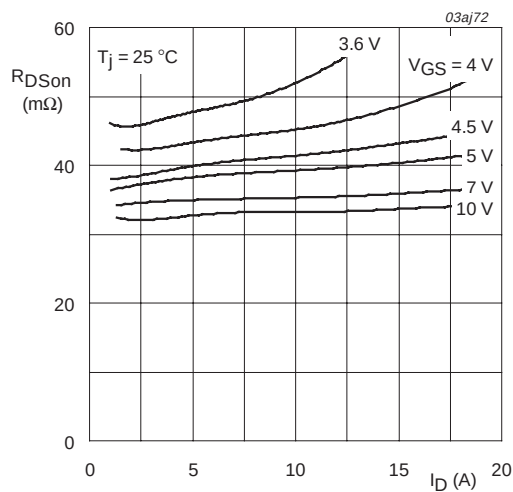
$T_j = 25^\circ\text{C}$

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



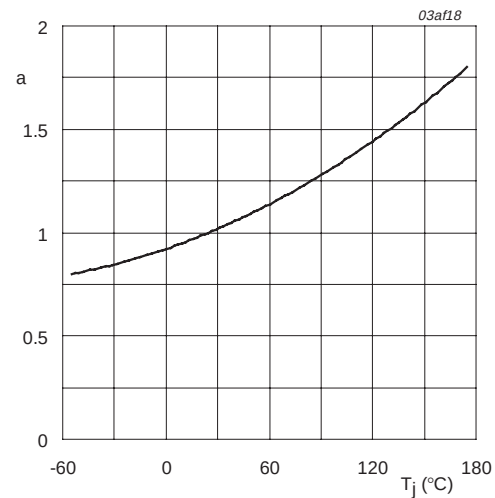
$T_j = 25^\circ\text{C}$ and 150°C ; $V_{DS} > I_D \times R_{DSon}$

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



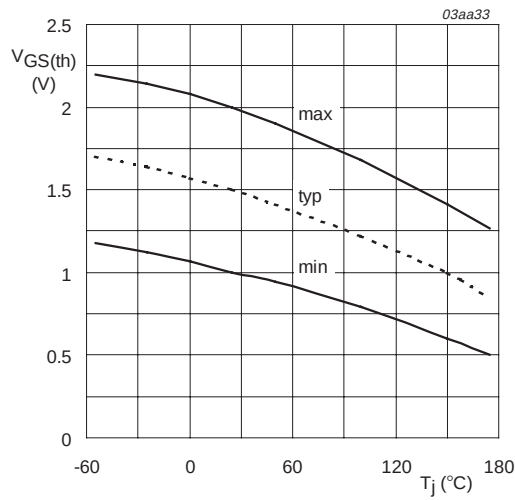
$T_j = 25^\circ\text{C}$

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



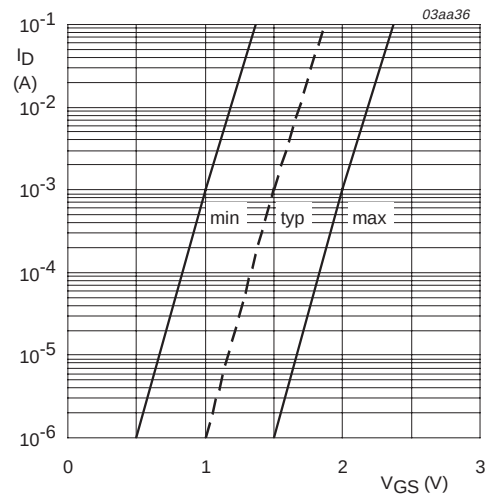
$$a = \frac{R_{DSon}}{R_{DSon(25^\circ\text{C})}}$$

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



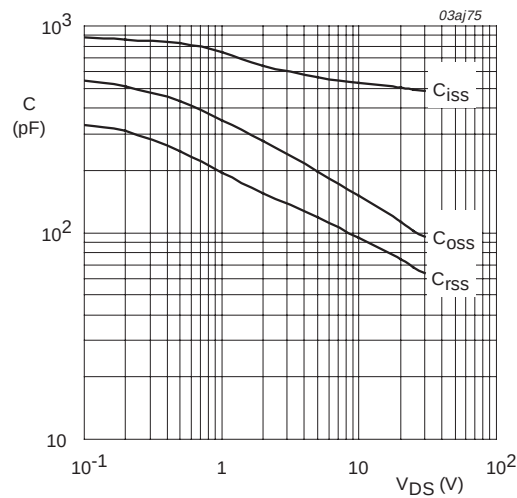
$I_D = 1 \text{ mA}; V_{DS} = V_{GS}$

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



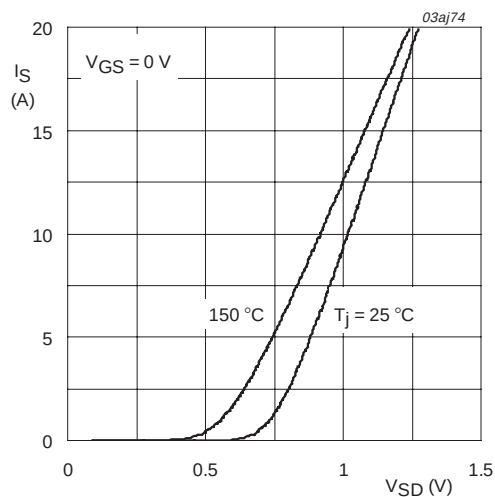
$T_J = 25 \text{ °C}; V_{DS} = 5 \text{ V}$

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



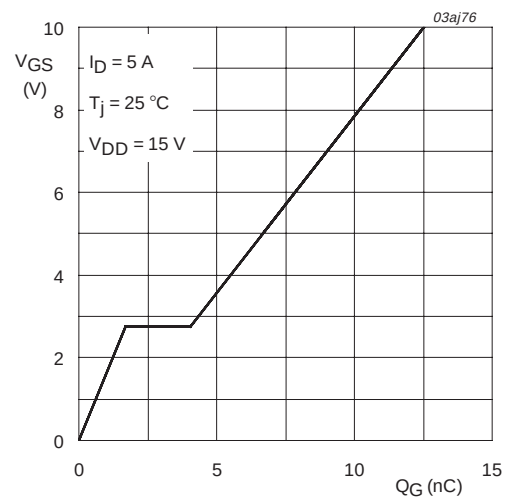
$V_{GS} = 0 \text{ V}; f = 1 \text{ MHz}$

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



$T_J = 25$ °C and 150 °C; $V_{GS} = 0$ V

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



$I_D = 5$ A; $V_{DD} = 15$ V

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

9. Package outline

Plastic surface mounted package; 6 leads

SOT457

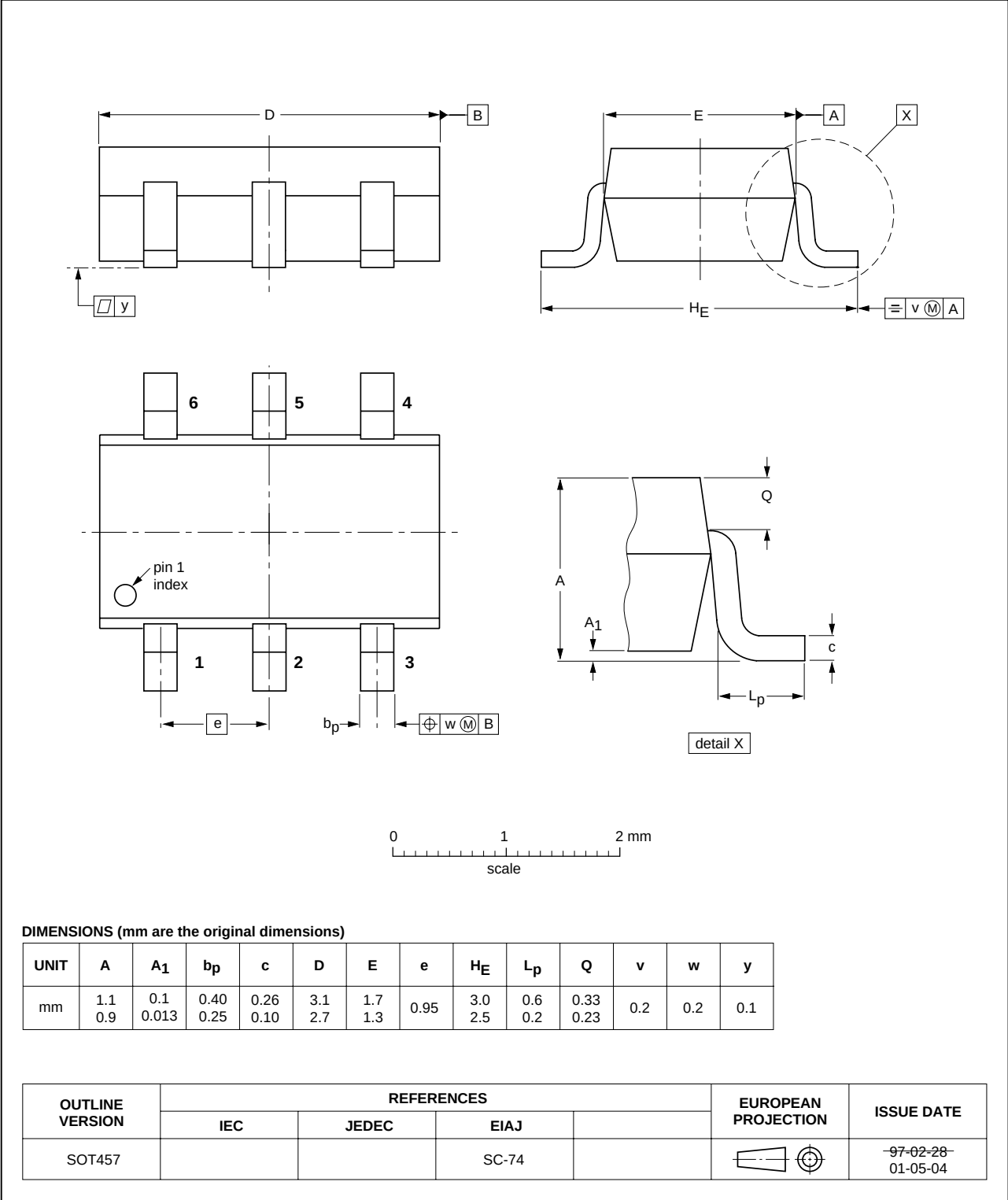


Fig 14. SOT457 (TSOP6).

10. Revision history

Table 6: Revision history

Rev	Date	CPCN	Description
01	20020927	-	Product data (9397 750 10193)

11. 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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