

PMEM4030PS

PNP transistor/Schottky rectifier module

Rev. 01 — 28 June 2005

Product data sheet

1. Product profile

1.1 General description

Combination of a PNP transistor with low V_{CEsat} and high current capability and a planar Schottky barrier rectifier with an integrated guard ring for stress protection in a SOT96-1 (SO8/MS-012) small plastic package. NPN complement: PMEM4030NS.

1.2 Features

- 1 W total power dissipation
- High current capability up to 2 A
- Reduces Printed-Circuit Board (PCB) area required
- Reduces pick and place costs
- Small plastic Surface Mounted Device (SMD) package
- Transistor
 - ◆ Low collector-emitter saturation voltage
- Diode
 - ◆ High-speed switching
 - ◆ Low forward voltage
 - ◆ Guard ring protected

1.3 Applications

- DC-to-DC converters
- Inductive load drivers
- General-purpose load drivers

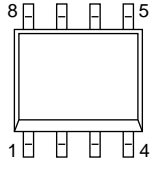
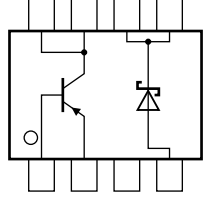
1.4 Quick reference data

Table 1: Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
PNP transistor						
V_{CEO}	collector-emitter voltage	open base	-	-	-50	V
I_C	collector current	continuous	-	-	-2	A
Schottky barrier rectifier						
V_R	reverse voltage		-	-	40	V
I_F	forward current		-	-	1	A

2. Pinning information

Table 2: Pinning

Pin	Description	Simplified outline	Symbol
1	base		
2	emitter		
3	not connected		
4	anode		
5	cathode		
6	cathode		
7	collector		
8	collector		

006aaa406

3. Ordering information

Table 3: Ordering information

Type number	Package		
	Name	Description	Version
PMEM4030PS	SO8	plastic small outline package; 8 leads; body width 3.9 mm	SOT96-1

4. Marking

Table 4: Marking codes

Type number	Marking code
PMEM4030PS	P4030PS

5. Limiting values

Table 5: Limiting values

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

Symbol	Parameter	Conditions	Min	Max	Unit	
PNP transistor						
V_{CBO}	collector-base voltage	open emitter	-	-50	V	
V_{CEO}	collector-emitter voltage	open base	-	-50	V	
V_{EBO}	emitter-base voltage	open collector	-	-5	V	
I_C	collector current	continuous	-	-2	A	
I_{CRM}	repetitive peak collector current	$t_p \leq 100$ ms; $\delta \leq 0.25$	-	-3	A	
I_{CM}	peak collector current		-	-5	A	
I_B	base current	continuous	-	-0.5	A	
P_{tot}	total power dissipation	$T_{amb} \leq 25$ °C	[1]	-	550	mW
			[2]	-	1	W
T_j	junction temperature		-	150	°C	
T_{amb}	ambient temperature		-65	+150	°C	
Schottky barrier rectifier						
V_R	reverse voltage		-	40	V	
I_F	forward current		-	1	A	
I_{FRM}	repetitive peak forward current	$t_p \leq 1$ ms; $\delta \leq 0.25$	-	3.5	A	
I_{FSM}	non-repetitive peak forward current	$t = 8.3$ μ s; half sine wave; JEDEC method	-	10	A	
I_{RSM}	non-repetitive peak reverse current	$t_p \leq 100$ μ s	-	0.5	A	
T_j	junction temperature		-	125	°C	
T_{amb}	ambient temperature		-65	+125	°C	
Combined device						
T_{stg}	storage temperature		-65	+150	°C	

[1] Device mounted on an FR4 PCB, single-sided copper, tin-plated, standard footprint.

[2] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for collector 1 cm².

6. Thermal characteristics

Table 6: Thermal characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit	
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1]	-	-	225	K/W
			[2]	-	-	125	K/W

[1] Device mounted on an FR4 PCB, single-sided copper, tin-plated, standard footprint.

[2] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for collector 1 cm².

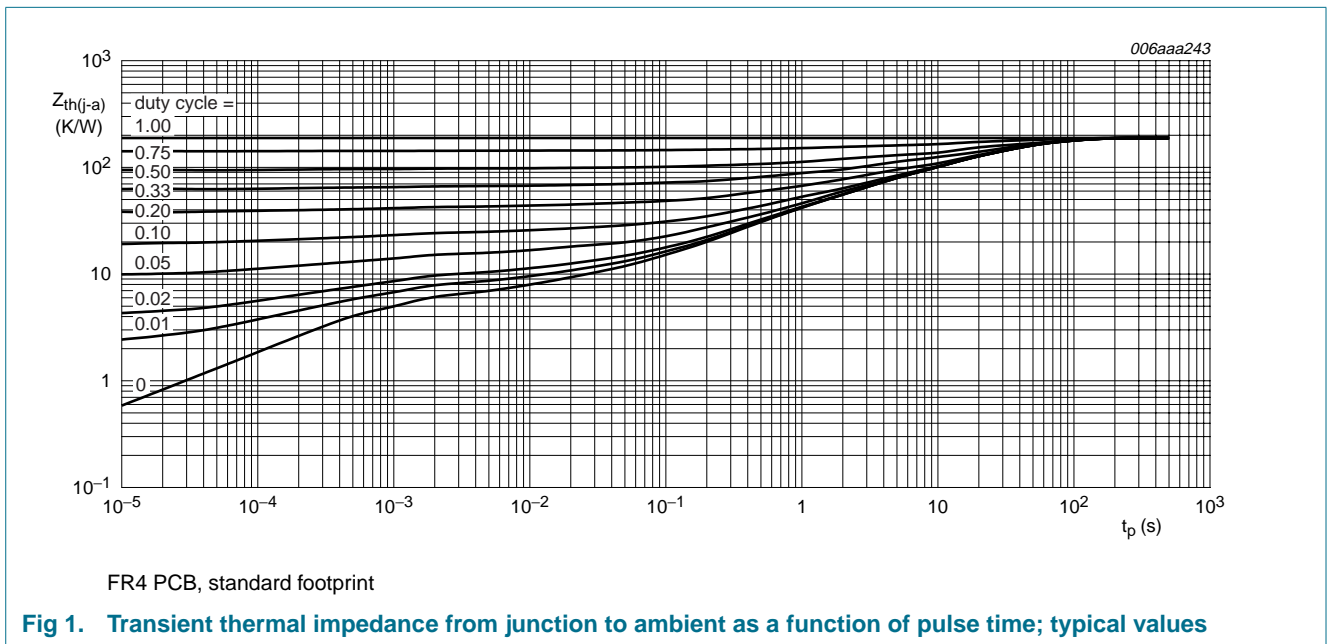


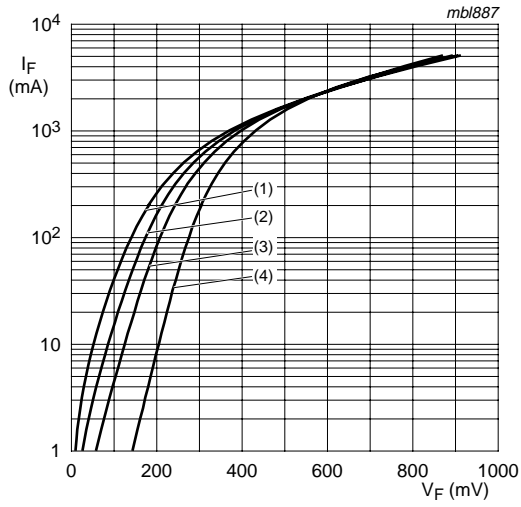
Fig 1. Transient thermal impedance from junction to ambient as a function of pulse time; typical values

7. Characteristics

Table 7: Characteristics
T_{amb} = 25 °C unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
PNP transistor						
I _{CBO}	collector-base cut-off current	V _{CB} = -50 V; I _E = 0 A	-	-	-100	nA
		V _{CB} = -50 V; I _E = 0 A; T _j = 150 °C	-	-	-50	μA
I _{EBO}	emitter-base cut-off current	V _{EB} = -5 V; I _C = 0 A	-	-	-100	nA
h _{FE}	DC current gain	V _{CE} = -2 V; I _C = -100 mA	200	-	-	
		V _{CE} = -2 V; I _C = -500 mA	200	-	-	
		V _{CE} = -2 V; I _C = -1 A	[1] 200	-	450	
		V _{CE} = -2 V; I _C = -2 A	[1] 130	-	-	
		V _{CE} = -2 V; I _C = -3 A	[1] 80	-	-	
V _{CEsat}	collector-emitter saturation voltage	I _C = -500 mA; I _B = -50 mA	-	-	-90	mV
		I _C = -1 A; I _B = -50 mA	-	-	-180	mV
		I _C = -2 A; I _B = -100 mA	[1] -	-	-320	mV
		I _C = -2 A; I _B = -200 mA	[1] -	-	-270	mV
		I _C = -3 A; I _B = -300 mA	[1] -	-	-390	mV
R _{CEsat}	collector-emitter saturation resistance	I _C = -2 A; I _B = -200 mA	[1] -	90	135	mΩ
V _{BEsat}	base-emitter saturation voltage	I _C = -2 A; I _B = -100 mA	[1] -	-	-1.1	V
		I _C = -3 A; I _B = -300 mA	[1] -	-	-1.2	V
V _{BEon}	base-emitter turn-on voltage	V _{CE} = -2 V; I _C = -1 A	[1] -1.0	-	-	V
f _T	transition frequency	V _{CE} = -5 V; I _C = -100 mA; f = 100 MHz	100	-	-	MHz
C _c	collector capacitance	V _{CB} = -10 V; I _E = i _e = 0 A; f = 1 MHz	-	-	35	pF
Schottky barrier rectifier						
V _F	forward voltage	I _F = 100 mA	[1] -	280	330	mV
		I _F = 1 A	[1] -	460	500	mV
I _R	reverse current	V _R = 10 V	[1] -	15	40	μA
		V _R = 40 V	[1] -	60	300	μA
C _d	diode capacitance	V _R = 4 V; f = 1 MHz;	-	65	80	pF

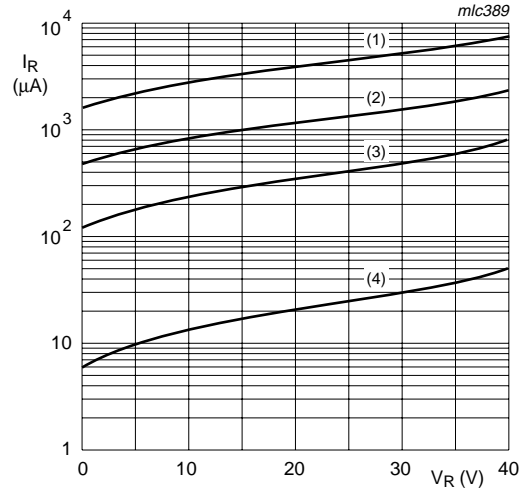
 [1] Pulse test: t_p ≤ 300 μs; δ ≤ 0.02.



Schottky barrier rectifier

- (1) $T_{amb} = 125\text{ °C}$
- (2) $T_{amb} = 100\text{ °C}$
- (3) $T_{amb} = 75\text{ °C}$
- (4) $T_{amb} = 25\text{ °C}$

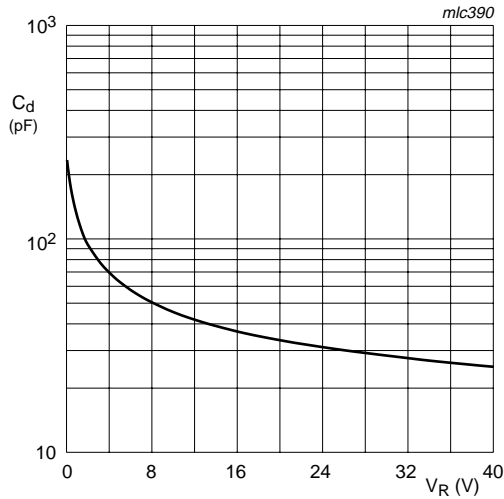
Fig 2. Forward current as a function of forward voltage; typical values



Schottky barrier rectifier

- (1) $T_{amb} = 125\text{ °C}$
- (2) $T_{amb} = 100\text{ °C}$
- (3) $T_{amb} = 75\text{ °C}$
- (4) $T_{amb} = 25\text{ °C}$

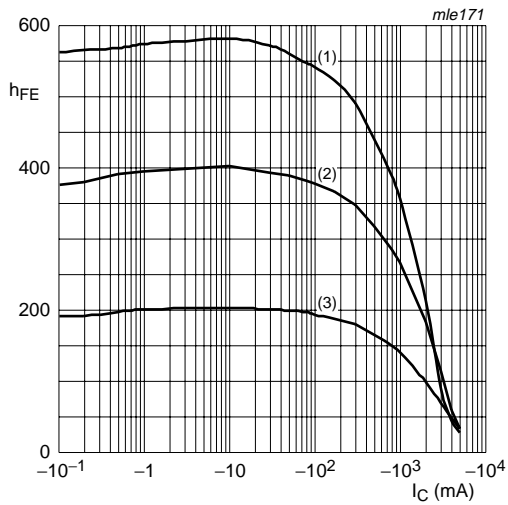
Fig 3. Reverse current as a function of reverse voltage; typical values



Schottky barrier rectifier

$f = 1\text{ MHz}$

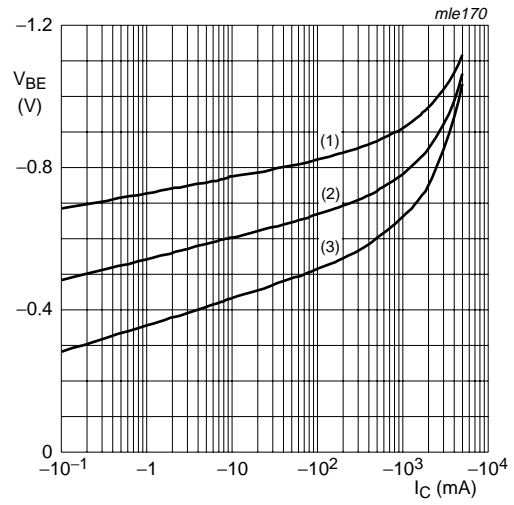
Fig 4. Diode capacitance as a function of reverse voltage; typical values



PNP transistor; $V_{CE} = -2\text{ V}$

- (1) $T_{amb} = 100\text{ °C}$
- (2) $T_{amb} = 25\text{ °C}$
- (3) $T_{amb} = -55\text{ °C}$

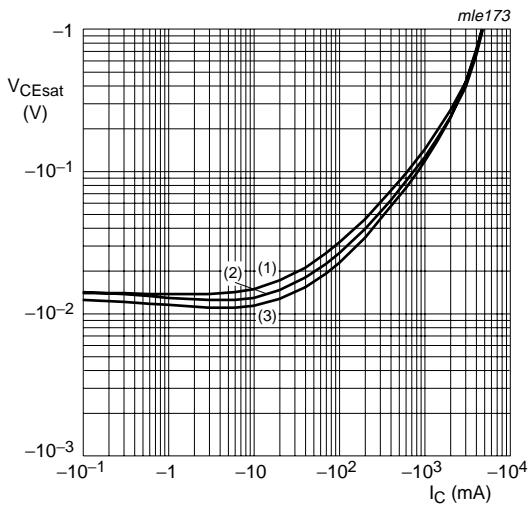
Fig 5. DC current gain as a function of collector current; typical values



PNP transistor; $V_{CE} = -2\text{ V}$

- (1) $T_{amb} = -55\text{ °C}$
- (2) $T_{amb} = 25\text{ °C}$
- (3) $T_{amb} = 100\text{ °C}$

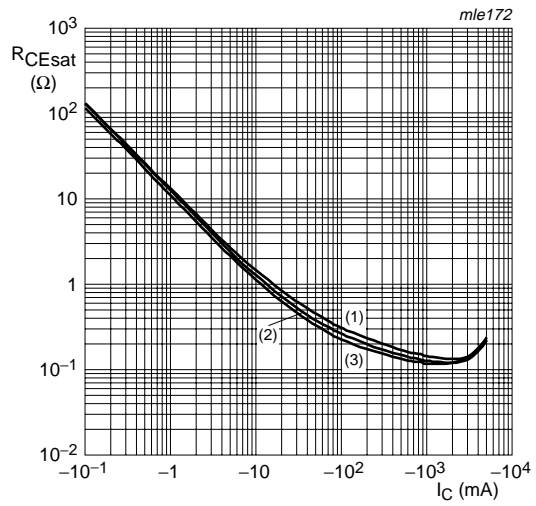
Fig 6. Base-emitter voltage as a function of collector current; typical values



PNP transistor; $I_C/I_B = 20$

- (1) $T_{amb} = 100\text{ °C}$
- (2) $T_{amb} = 25\text{ °C}$
- (3) $T_{amb} = -55\text{ °C}$

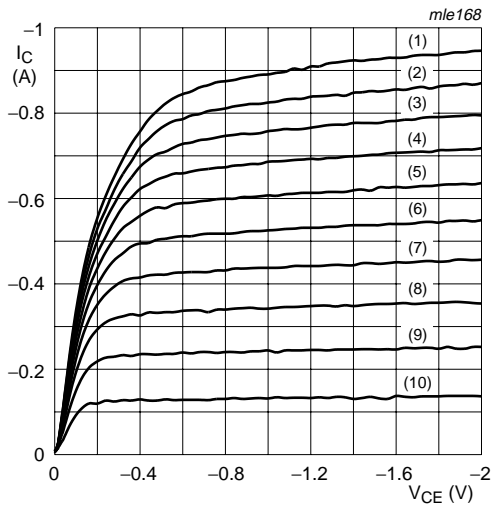
Fig 7. Collector-emitter saturation voltage as a function of collector current; typical values



PNP transistor; $I_C/I_B = 20$

- (1) $T_{amb} = 150\text{ °C}$
- (2) $T_{amb} = 25\text{ °C}$
- (3) $T_{amb} = -55\text{ °C}$

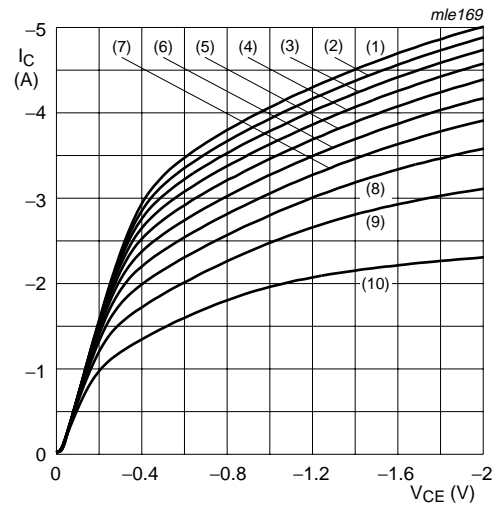
Fig 8. Collector-emitter saturation resistance as a function of collector current; typical values



$T_{amb} = 25\text{ }^{\circ}\text{C}$

- (1) $I_B = -3500\text{ }\mu\text{A}$
- (2) $I_B = -3150\text{ }\mu\text{A}$
- (3) $I_B = -2800\text{ }\mu\text{A}$
- (4) $I_B = -2450\text{ }\mu\text{A}$
- (5) $I_B = -2100\text{ }\mu\text{A}$
- (6) $I_B = -1750\text{ }\mu\text{A}$
- (7) $I_B = -1400\text{ }\mu\text{A}$
- (8) $I_B = -1050\text{ }\mu\text{A}$
- (9) $I_B = -700\text{ }\mu\text{A}$
- (10) $I_B = -350\text{ }\mu\text{A}$

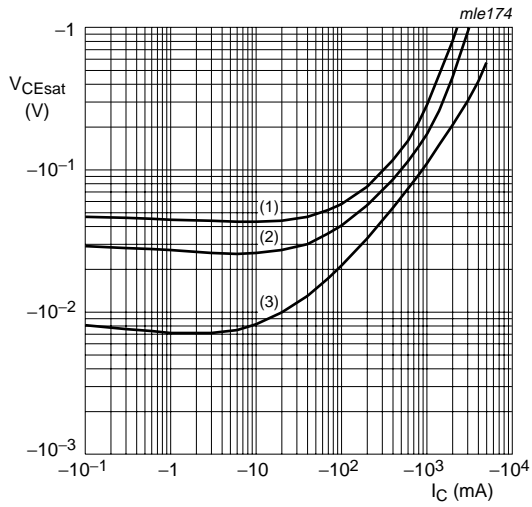
Fig 9. Collector current as a function of collector-emitter voltage; typical values



$T_{amb} = 25\text{ }^{\circ}\text{C}$

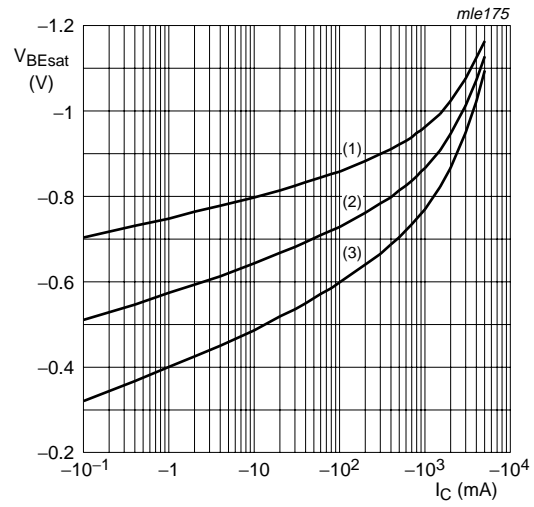
- (1) $I_B = -140\text{ mA}$
- (2) $I_B = -126\text{ mA}$
- (3) $I_B = -112\text{ mA}$
- (4) $I_B = -98\text{ mA}$
- (5) $I_B = -84\text{ mA}$
- (6) $I_B = -70\text{ mA}$
- (7) $I_B = -56\text{ mA}$
- (8) $I_B = -42\text{ mA}$
- (9) $I_B = -28\text{ mA}$
- (10) $I_B = -14\text{ mA}$

Fig 10. Collector current as a function of collector-emitter voltage; typical values



$T_{amb} = 25\text{ }^{\circ}\text{C}$
 (1) $I_C/I_B = 100$
 (2) $I_C/I_B = 50$
 (3) $I_C/I_B = 10$

Fig 11. Collector-emitter saturation voltage as a function of collector current; typical values



$I_C/I_B = 20$
 (1) $T_{amb} = -55\text{ }^{\circ}\text{C}$
 (2) $T_{amb} = 25\text{ }^{\circ}\text{C}$
 (3) $T_{amb} = 100\text{ }^{\circ}\text{C}$

Fig 12. Base-emitter saturation voltage as a function of collector current; typical values

8. Application information

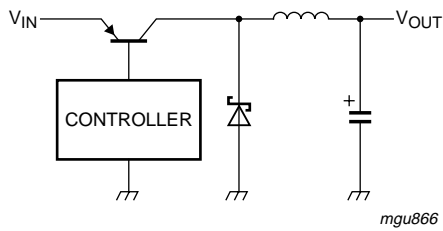


Fig 13. DC-to-DC converter

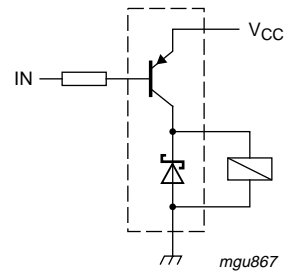


Fig 14. Inductive load driver (relays, motors and buzzers) with free-wheeling diode

9. Package outline

SO8: plastic small outline package; 8 leads; body width 3.9 mm

SOT96-1

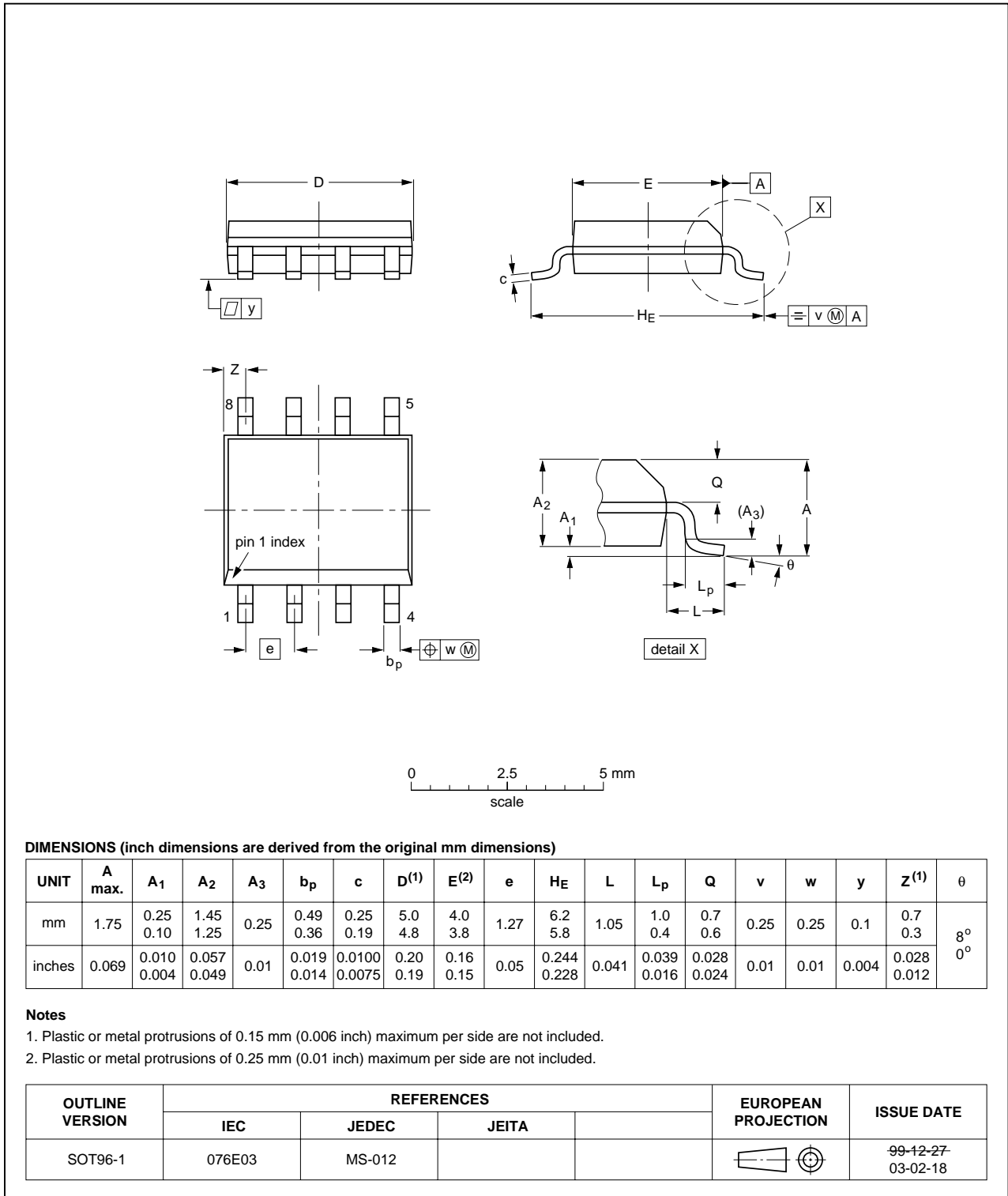


Fig 15. Package outline SOT96-1 (SO8/MS-012)

10. Packing information

Table 8: Packing methods

The indicated -xxx are the last three digits of the 12NC ordering code. [\[1\]](#)

Type number	Package	Description	Packing quantity	
			1000	2500
PMEM4030PS	SOT96-1	8 mm pitch, 12 mm tape and reel	-115	-118

[1] For further information and the availability of packing methods, see [Section 16](#).

11. Revision history

Table 9: Revision history

Document ID	Release date	Data sheet status	Change notice	Doc. number	Supersedes
PMEM4030PS_1	20050628	Product data sheet	-	9397 750 15064	-

12. Data sheet status

Level	Data sheet status ^[1]	Product status ^{[2] [3]}	Definition
I	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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[3] For data sheets describing multiple type numbers, the highest-level product status determines the data sheet status.

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