

PMEM4030NS

NPN transistor/Schottky rectifier module

Rev. 01 — 25 May 2005

Product data sheet

1. Product profile

1.1 General description

Combination of a NPN 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. PNP complement: PMEM4030PS.

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 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

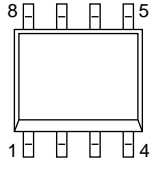
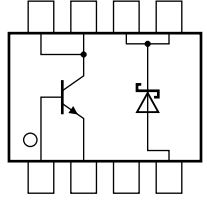
Table 1: Quick reference data

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

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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		

3. Ordering information

Table 3: Ordering information

Type number	Package		
	Name	Description	Version
PMEM4030NS	SO8	plastic small outline package; 8 leads; body width 3.9 mm	SOT96-1

4. Marking

Table 4: Marking codes

Type number	Marking code
PMEM4030NS	P4030NS

5. Limiting values

Table 5: Limiting values

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

Symbol	Parameter	Conditions	Min	Max	Unit	
NPN 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 (DC)	continuous	-	2	A	
I_{CRP}	repetitive pulsed collector current	$t_p \leq 100$ ms; $\delta \leq 0.25$	-	3	A	
I_{CM}	peak collector current		-	5	A	
I_B	base current (DC)	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.

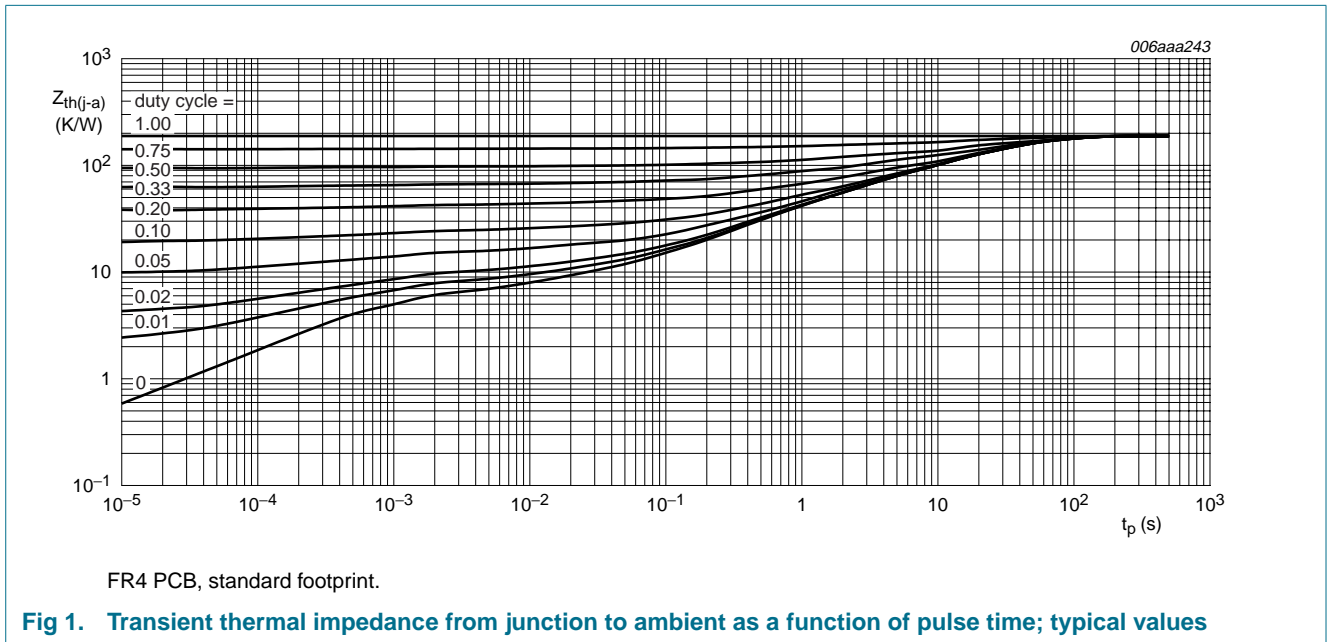
6. Thermal characteristics

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.

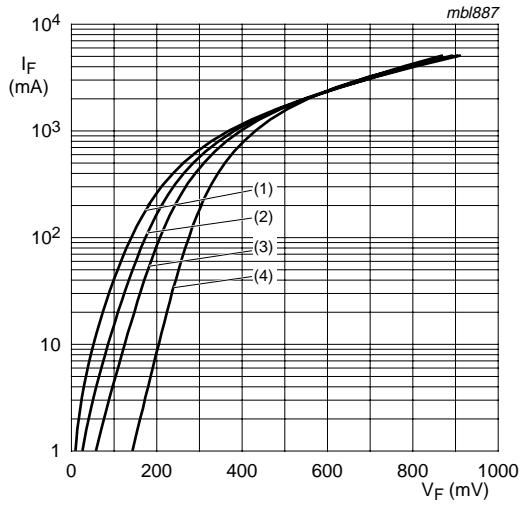


7. Characteristics

Table 7: Characteristics
 $T_{amb} = 25\text{ }^{\circ}\text{C}$ unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
NPN transistor						
I_{CBO}	collector-base cut-off current	$V_{CB} = 50\text{ V}; I_E = 0\text{ A}$	-	-	100	nA
		$V_{CB} = 50\text{ V}; I_E = 0\text{ A}; T_j = 150\text{ }^{\circ}\text{C}$	-	-	50	μA
I_{EBO}	emitter-base cut-off current	$V_{EB} = 5\text{ V}; I_C = 0\text{ A}$	-	-	100	nA
h_{FE}	DC current gain	$V_{CE} = 2\text{ V}; I_C = 100\text{ mA}$	200	-	-	
		$V_{CE} = 2\text{ V}; I_C = 500\text{ mA}$	200	-	-	
		$V_{CE} = 2\text{ V}; I_C = 1\text{ A}$	[1] 200	-	450	
		$V_{CE} = 2\text{ V}; I_C = 2\text{ A}$	[1] 130	-	-	
		$V_{CE} = 2\text{ V}; I_C = 3\text{ A}$	[1] 80	-	-	
V_{CEsat}	collector-emitter saturation voltage	$I_C = 500\text{ mA}; I_B = 50\text{ mA}$	-	-	80	mV
		$I_C = 1\text{ A}; I_B = 50\text{ mA}$	-	-	160	mV
		$I_C = 2\text{ A}; I_B = 100\text{ mA}$	[1] -	-	280	mV
		$I_C = 2\text{ A}; I_B = 200\text{ mA}$	[1] -	-	260	mV
		$I_C = 3\text{ A}; I_B = 300\text{ mA}$	[1] -	-	370	mV
R_{CEsat}	collector-emitter saturation resistance	$I_C = 2\text{ A}; I_B = 200\text{ mA}$	[1] -	100	130	$\text{m}\Omega$
V_{BEsat}	base-emitter saturation voltage	$I_C = 2\text{ A}; I_B = 100\text{ mA}$	[1] -	-	1.1	V
		$I_C = 3\text{ A}; I_B = 300\text{ mA}$	[1] -	-	1.2	V
V_{BEon}	base-emitter turn-on voltage	$V_{CE} = 2\text{ V}; I_C = 1\text{ A}$	[1] 1.1	-	-	V
f_T	transition frequency	$V_{CE} = 5\text{ V}; I_C = 100\text{ mA}; f = 100\text{ MHz}$	100	-	-	MHz
C_c	collector capacitance	$V_{CB} = 10\text{ V}; I_E = I_e = 0\text{ A}; f = 1\text{ MHz}$	-	-	25	pF
Schottky barrier rectifier						
V_F	forward voltage	$I_F = 100\text{ mA}$	[1] -	280	330	mV
		$I_F = 1\text{ A}$	[1] -	460	500	mV
I_R	reverse current	$V_R = 10\text{ V}$	[1] -	15	40	μA
		$V_R = 40\text{ V}$	[1] -	60	300	μA
C_d	diode capacitance	$V_R = 4\text{ V}; f = 1\text{ MHz};$	-	65	80	pF

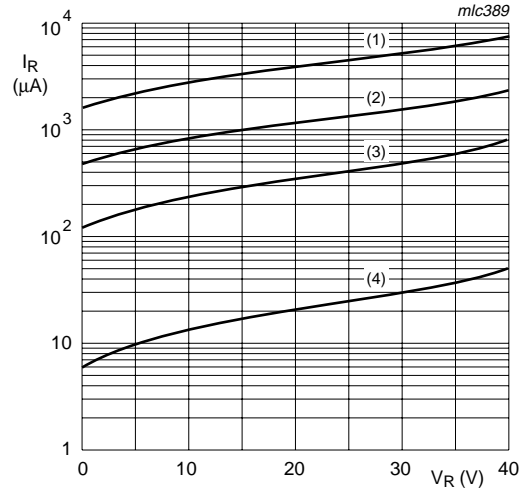
[1] Pulse test: $t_p \leq 300\text{ }\mu\text{s}; \delta \leq 0.02$.



Schottky barrier rectifier

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

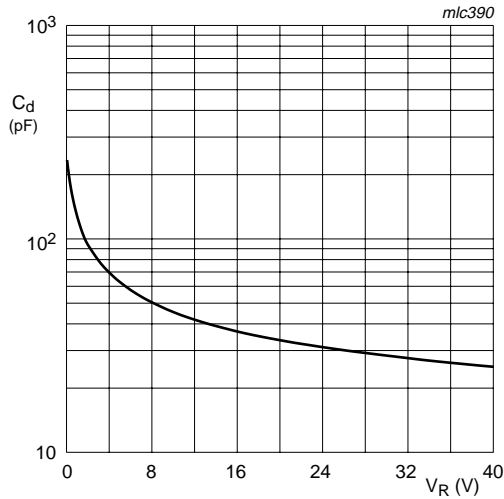
Fig 2. Forward current as a function of forward voltage; typical values



Schottky barrier rectifier

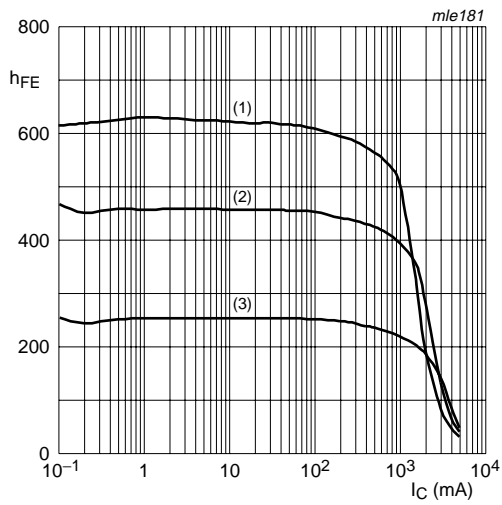
- (1) $T_{amb} = 125\text{ °C}$
- (2) $T_{amb} = 100\text{ °C}$
- (3) $T_{amb} = 75\text{ °C}$
- (4) $T_{amb} = 25\text{ °C}$

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



Schottky barrier rectifier;
 $f = 1\text{ MHz}$

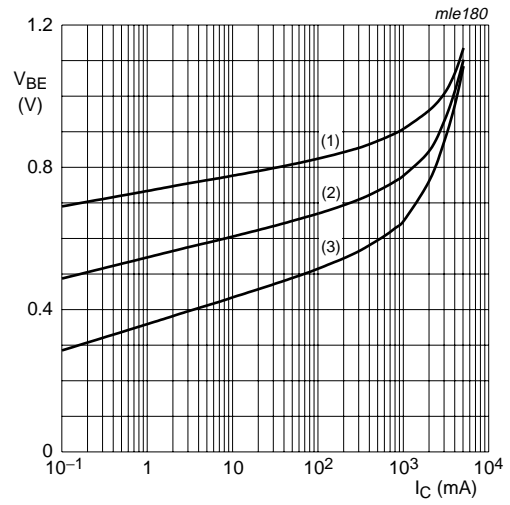
Fig 4. Diode capacitance as a function of reverse voltage; typical values



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

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

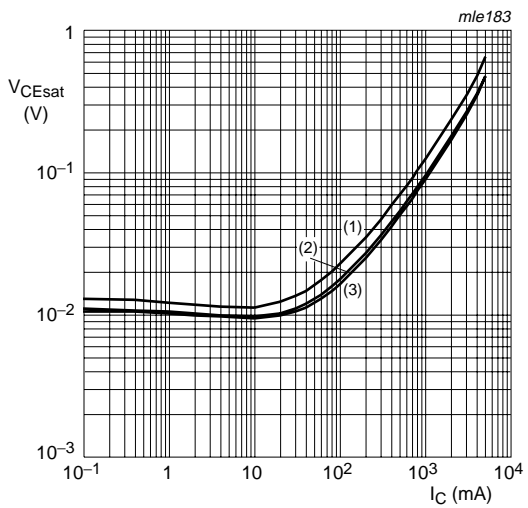
Fig 5. DC current gain as a function of collector current; typical values



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

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

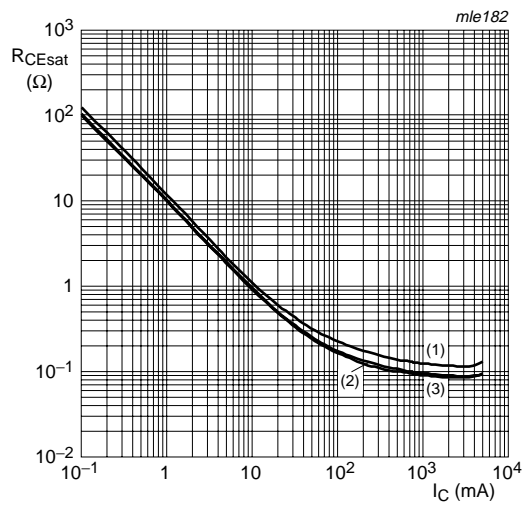
Fig 6. Base-emitter voltage as a function of collector current; typical values



NPN transistor; $I_C/I_B = 20$

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

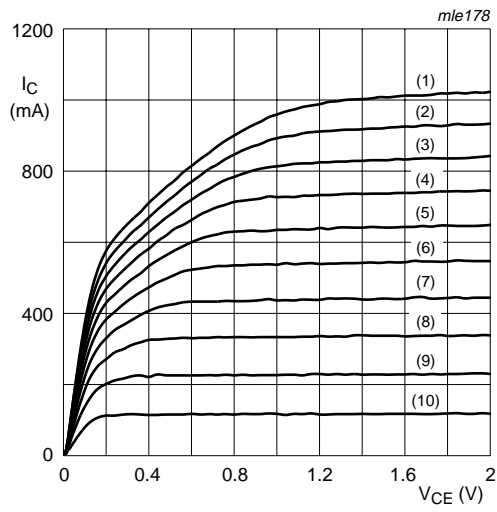
Fig 7. Collector-emitter saturation voltage as a function of collector current; typical values



NPN transistor; $I_C/I_B = 20$

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

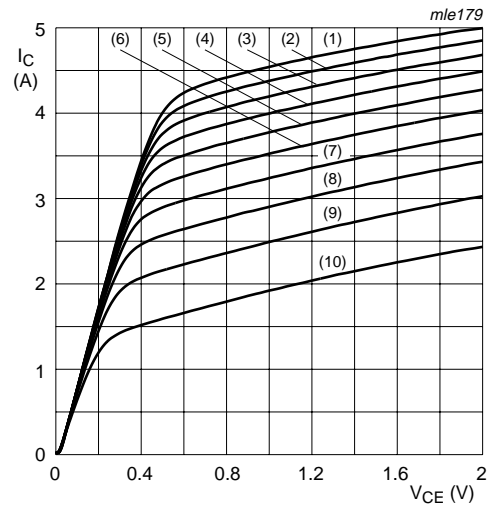
Fig 8. Collector-emitter saturation resistance as a function of collector current; typical values



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

- (1) $I_B = 2600\text{ }\mu\text{A}$
- (2) $I_B = 2340\text{ }\mu\text{A}$
- (3) $I_B = 2080\text{ }\mu\text{A}$
- (4) $I_B = 1820\text{ }\mu\text{A}$
- (5) $I_B = 1560\text{ }\mu\text{A}$
- (6) $I_B = 1300\text{ }\mu\text{A}$
- (7) $I_B = 1040\text{ }\mu\text{A}$
- (8) $I_B = 780\text{ }\mu\text{A}$
- (9) $I_B = 520\text{ }\mu\text{A}$
- (10) $I_B = 260\text{ }\mu\text{A}$

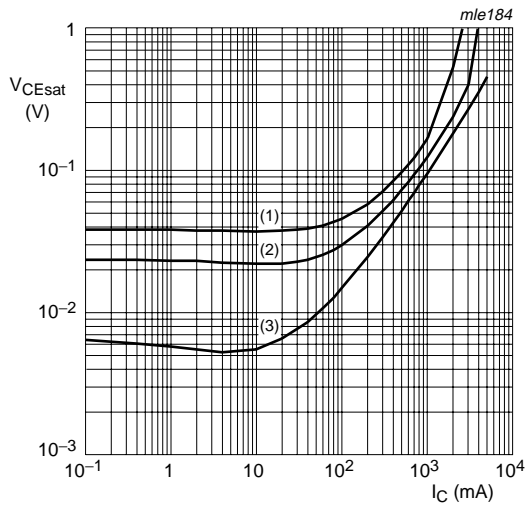
Fig 9. Collector current as a function of collector-emitter voltage; typical values



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

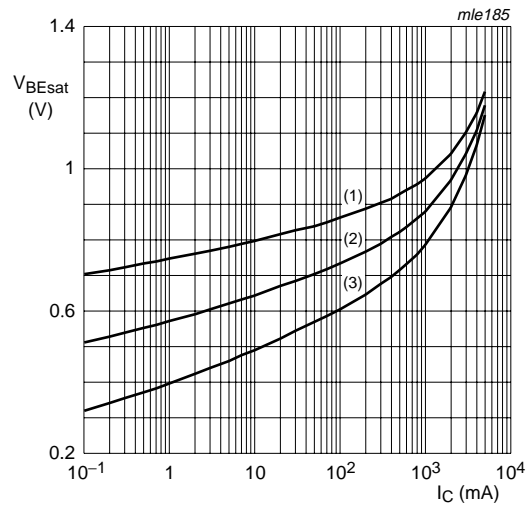
- (1) $I_B = 120\text{ mA}$
- (2) $I_B = 108\text{ mA}$
- (3) $I_B = 96\text{ mA}$
- (4) $I_B = 84\text{ mA}$
- (5) $I_B = 72\text{ mA}$
- (6) $I_B = 60\text{ mA}$
- (7) $I_B = 48\text{ mA}$
- (8) $I_B = 36\text{ mA}$
- (9) $I_B = 24\text{ mA}$
- (10) $I_B = 12\text{ mA}$

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

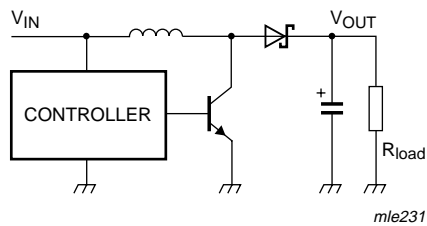


Fig 13. DC-to-DC converter

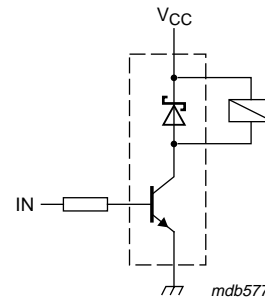


Fig 14. Inductive load driver (relays, motors and buzzers) with free-wheeling diode

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
PMEM4030NS	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
PMEM4030NS_1	20050525	Product data sheet	-	9397 750 15065	-

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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