

PMEM1505PG

PNP transistor/Schottky rectifier module

Rev. 01 — 26 May 2004

Product data sheet

1. Product profile

1.1 General description

Combination of an 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 SOT353 (SC-88A) small plastic package. NPN complement: PMEM1505NG.

1.2 Features

- 300 mW total power dissipation
- Current capability up to 0.5 A
- Reduces printed-circuit board area required
- Reduces pick and place costs
- Small plastic SMD package
- Transistor
 - ◆ Low collector-emitter saturation voltage.
- Diode
 - ◆ Ultra high-speed switching
 - ◆ Very low forward voltage
 - ◆ Guard ring protected.

1.3 Applications

- DC-to-DC converters
- Inductive load drivers
- General purpose load drivers
- Reverse polarity protection circuits
- MOSFET 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 | - | - | -15 | V |
| I_C | collector current (DC) | continuous | [1] | - | -0.5 | A |
| Schottky barrier rectifier | | | | | | |
| V_R | continuous reverse voltage | | - | - | 20 | V |
| I_F | continuous forward current | | - | - | 0.5 | A |

[1] Mounted on a FR4 printed-circuit board, single-sided copper, tin-plated, standard footprint for SOT353.

PHILIPS

2. Pinning information

Table 2: Discrete pinning

| Pin | Description | Simplified outline | Symbol |
|-----|-------------|--------------------|---------------|
| 1 | anode | <p>Top view</p> | <p>sym024</p> |
| 5 | cathode | | |
| 4 | collector | | |
| 2 | base | | |
| 3 | emitter | | |

3. Ordering information

Table 3: Ordering information

| Type number | Package | | |
|-------------|---------|--|---------|
| | Name | Description | Version |
| PMEM1505PG | - | plastic surface mounted package; 5 leads | SOT353 |

4. Marking

Table 4: Marking

| Type number | Marking code ^[1] |
|-------------|-----------------------------|
| PMEM1505PG | L6* |

- [1] * = p: made in Hong Kong.
 * = t: made in Malaysia.
 * = W: made in China.

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 | - | -15 | V |
| V_{CEO} | collector-emitter voltage | open base | - | -15 | V |
| V_{EBO} | emitter-base voltage | open collector | - | -6 | V |
| I_C | collector current (DC) | continuous | ^[1] | -0.5 | A |
| | | continuous | ^[2] | -0.6 | A |
| | | continuous; $T_s \leq 55\text{ °C}$ | ^[3] | -1 | A |
| I_{CM} | peak collector current | | - | -1 | A |
| I_{BM} | peak base current | | - | -100 | mA |

Table 5: Limiting values ...continued
In accordance with the Absolute Maximum Rating System (IEC 60134).

| Symbol | Parameter | Conditions | Min | Max | Unit |
|-----------------------------------|-------------------------------------|------------------------------|-----|------|------|
| P _{tot} | total power dissipation | T _{amb} ≤ 25 °C [1] | - | 200 | mW |
| | | T _{amb} ≤ 25 °C [2] | - | 250 | mW |
| | | T _s ≤ 55 °C [3] | - | 800 | mW |
| T _j | junction temperature | | - | 150 | °C |
| Schottky barrier rectifier | | | | | |
| V _R | continuous reverse voltage | | - | 20 | V |
| I _F | continuous forward current | | - | 0.5 | A |
| I _{FSM} | non-repetitive peak forward current | t = 8.3 ms square wave | - | 5 | A |
| P _{tot} | total power dissipation | T _{amb} ≤ 25 °C [1] | - | 200 | mW |
| | | T _{amb} ≤ 25 °C [2] | - | 250 | mW |
| | | T _s ≤ 55 °C [3] | - | 800 | mW |
| T _j | junction temperature | | [2] | 125 | °C |
| Combined device | | | | | |
| P _{tot} | total power dissipation | T _{amb} ≤ 25 °C [2] | - | 300 | mW |
| T _{stg} | storage temperature | | -65 | +150 | °C |
| T _{amb} | operating ambient temperature | | [2] | +150 | °C |

- [1] Mounted on a FR4 printed-circuit board, single-sided copper, tin-plated, standard footprint for SOT353.
- [2] Device mounted on a printed-circuit board, single-sided copper, tin-plated, 1 cm² mounting pad for both collector and cathode.
- [3] Solder point of collector or cathode tab.

6. Thermal characteristics

Table 6: Thermal characteristics [1]

| Symbol | Parameter | Conditions | Typ | Unit |
|------------------------|-------------------------------|-------------|---------|------|
| Single device | | | | |
| R _{th(j-s)} | from junction to solder point | in free air | [2] 120 | K/W |
| R _{th(j-a)} | from junction to ambient | in free air | [3] 395 | K/W |
| | | | [4] 495 | K/W |
| Combined device | | | | |
| R _{th(j-a)} | from junction to ambient | in free air | [5] 410 | K/W |

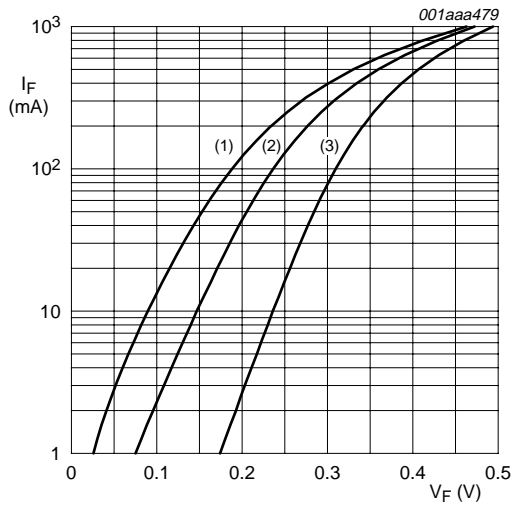
- [1] For Schottky barrier rectifiers thermal run-away has to be considered, as in some applications the reverse power losses P_R are a significant part of the total power losses. Nomograms for determining the reverse power losses P_R and I_{F(AV)} rating will be available on request.
- [2] Solder point of collector or cathode tab.
- [3] Device mounted on a printed-circuit board, single-sided copper, tin-plated, 1 cm² mounting pad for both collector and cathode.
- [4] Mounted on a FR4 printed-circuit board, single-sided copper, tin-plated, standard footprint for SOT353.
- [5] Mounted on a ceramic printed-circuit board, single-sided copper, tin-plated, standard footprint.

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} = -15 V; I _E = 0 A | - | - | -100 | nA | |
| | | V _{CB} = -15 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 = -10 mA | 200 | - | - | | |
| | | V _{CE} = -2 V; I _C = -100 mA | 150 | - | - | | |
| | | V _{CE} = -2 V; I _C = -500 mA | 90 | - | - | | |
| V _{CEsat} | collector-emitter saturation voltage | I _C = -10 mA; I _B = -0.5 mA | [1] | - | -25 | mV | |
| | | I _C = -200 mA; I _B = -10 mA | - | - | -150 | mV | |
| | | I _C = -500 mA; I _B = -50 mA | - | - | -250 | mV | |
| R _{CEsat} | equivalent on-resistance | I _C = -500 mA; I _B = -50 mA | [1] | 300 | < 500 | mΩ | |
| V _{BEsat} | base-emitter saturation voltage | I _C = -500 mA; I _B = -50 mA | [1] | - | -1.1 | V | |
| V _{BEon} | base-emitter turn-on voltage | V _{CE} = -2 V; I _C = -100 mA | [1] | - | -0.9 | V | |
| f _T | transition frequency | V _{CE} = -10 V; I _C = -50 mA; f = 100 MHz | [1] | 100 | 280 | MHz | |
| C _c | collector capacitance | V _{CB} = -10 V; I _E = I _e = 0 A; f = 1 MHz | - | 4.4 | 10 | pF | |
| Schottky barrier rectifier | | | | | | | |
| V _F | continuous forward voltage | see Figure 1 | | | | | |
| | | I _F = 10 mA | [1] | - | 240 | 270 | mV |
| | | I _F = 100 mA | [1] | - | 300 | 350 | mV |
| | | I _F = 500 mA | [1] | - | 400 | 460 | mV |
| I _R | reverse current | see Figure 2 | | | | | |
| | | V _R = 5 V | [1] | - | 5 | 10 | μA |
| | | V _R = 8 V | [1] | - | 7 | 20 | μA |
| | | V _R = 15 V | [1] | - | 10 | 50 | μA |
| C _d | diode capacitance | V _R = 5 V; f = 1 MHz; see Figure 3 | - | 19 | 25 | pF | |

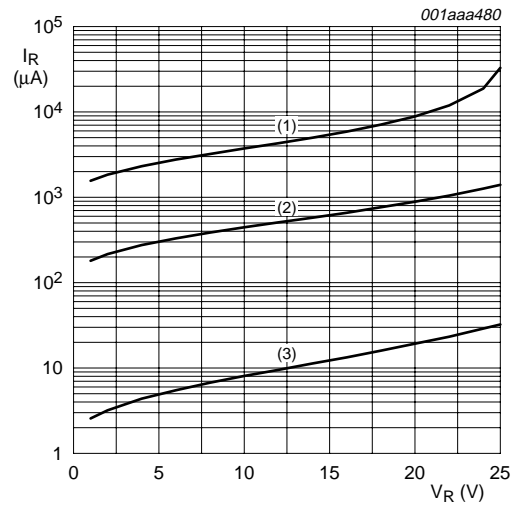
[1] Pulse test: t_p ≤ 300 μs; δ ≤ 0.02.



Schottky barrier rectifier.

- (1) $T_{amb} = 125\text{ }^{\circ}\text{C}$.
- (2) $T_{amb} = 85\text{ }^{\circ}\text{C}$.
- (3) $T_{amb} = 25\text{ }^{\circ}\text{C}$.

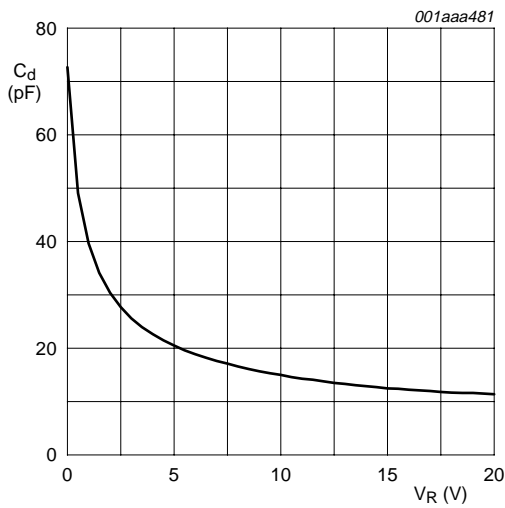
Fig 1. Forward current as a function of forward voltage; typical values.



Schottky barrier rectifier.

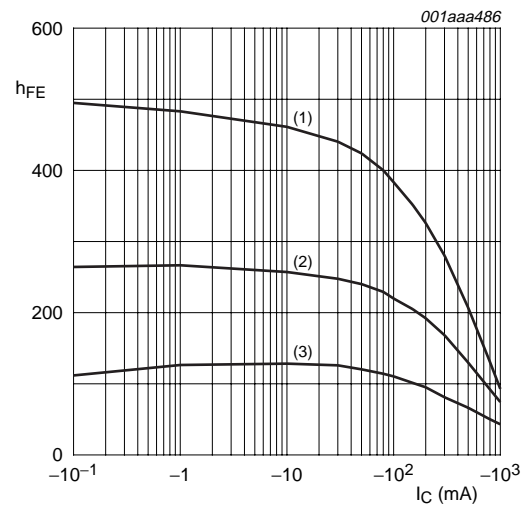
- (1) $T_{amb} = 125\text{ }^{\circ}\text{C}$.
- (2) $T_{amb} = 85\text{ }^{\circ}\text{C}$.
- (3) $T_{amb} = 25\text{ }^{\circ}\text{C}$.

Fig 2. Reverse current as a function of reverse voltage; typical values.



Schottky barrier rectifier; $f = 1\text{ MHz}$; $T_{amb} = 25\text{ }^{\circ}\text{C}$.

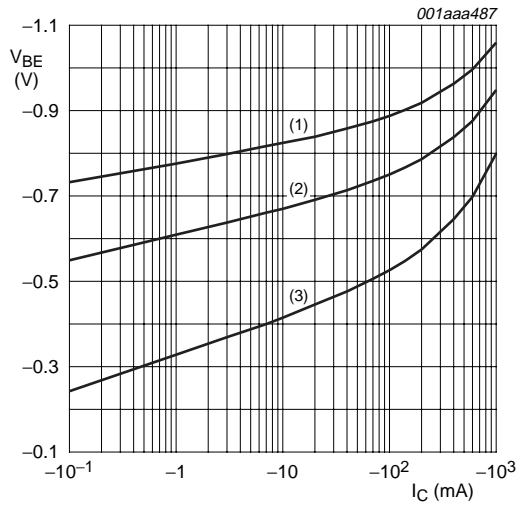
Fig 3. Diode capacitance as a function of reverse voltage; typical values.



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

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

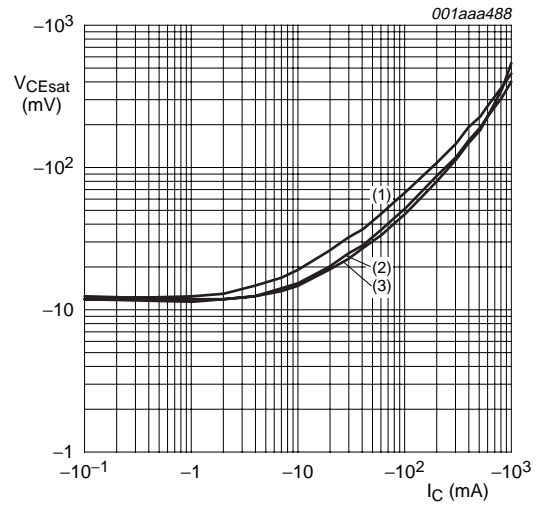
Fig 4. DC current gain as a function of collector current; typical values.



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

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

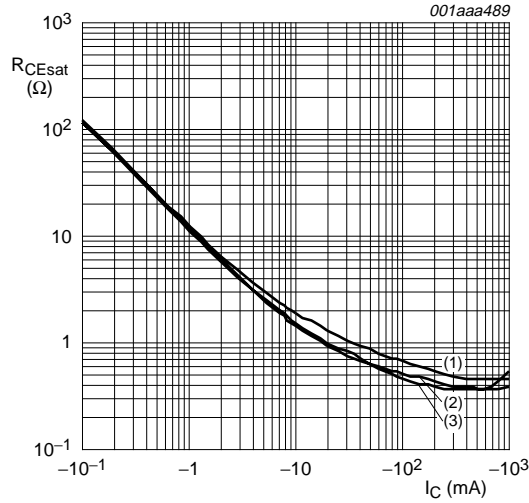
Fig 5. Base-emitter voltage as a function of collector current; typical values.



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

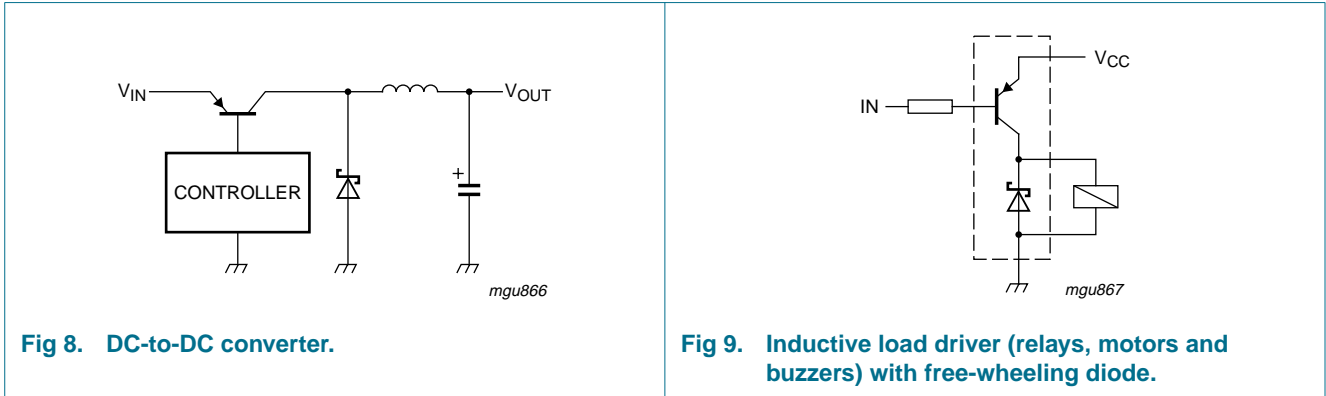


PNP transistor; $V_{CE} = -2\text{ V}$.

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

Fig 7. Equivalent on-resistance as a function of collector current; typical values.

8. Application information



9. Package outline

Plastic surface mounted package; 5 leads

SOT353

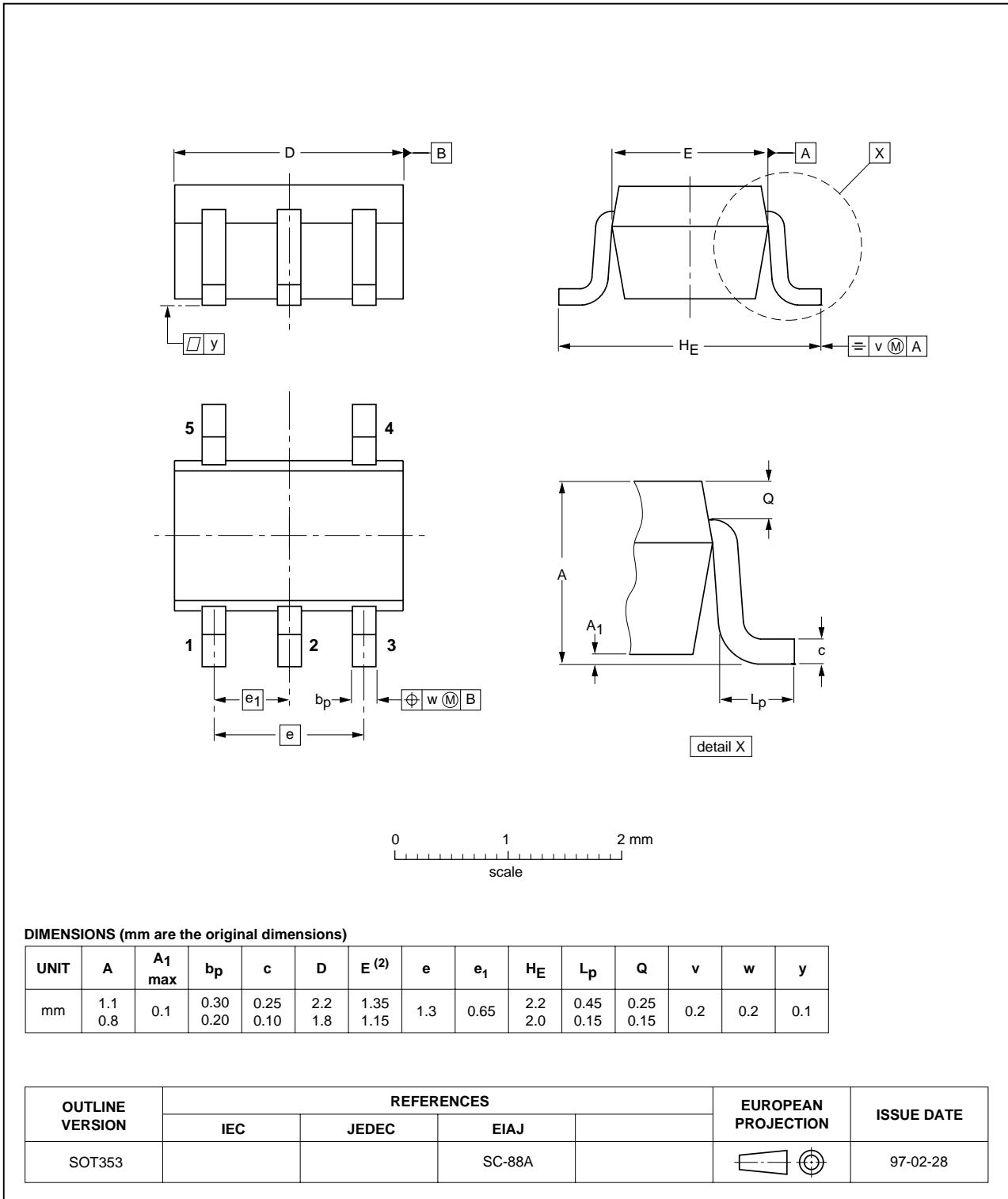


Fig 10. Package outline.

10. Revision history

Table 8: Revision history

| Document ID | Release date | Data sheet status | Change notice | Order number | Supersedes |
|--------------|--------------|-------------------|---------------|----------------|------------|
| PMEM1505PG_1 | 20040526 | Product data | - | 9397 750 12751 | - |

11. 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. |
| II | Preliminary data | Qualification | This data sheet contains data from the preliminary specification. Supplementary data will be published at a later date. Philips Semiconductors reserves the right to change the specification without notice, in order to improve the design and supply the best possible product. |
| III | Product data | Production | This data sheet contains data from the product specification. Philips Semiconductors reserves the right to make changes at any time in order to improve the design, manufacturing and supply. Relevant changes will be communicated via a Customer Product/Process Change Notification (CPCN). |

[1] Please consult the most recently issued data sheet before initiating or completing a design.

[2] The product status of the device(s) described in this data sheet may have changed since this data sheet was published. The latest information is available on the Internet at URL <http://www.semiconductors.philips.com>.

[3] For data sheets describing multiple type numbers, the highest-level product status determines the data sheet status.

12. Definitions

Short-form specification — The data in a short-form specification is extracted from a full data sheet with the same type number and title. For detailed information see the relevant data sheet or data handbook.

Limiting values definition — Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 60134). Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or at any other conditions above those given in the Characteristics sections of the specification is not implied. Exposure to limiting values for extended periods may affect device reliability.

Application information — Applications that are described herein for any of these products are for illustrative purposes only. Philips Semiconductors make no representation or warranty that such applications will be suitable for the specified use without further testing or modification.

13. Disclaimers

Life support — These products are not designed for use in life support appliances, devices, or systems where malfunction of these products can reasonably be expected to result in personal injury. Philips Semiconductors customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify Philips Semiconductors for any damages resulting from such application.

Right to make changes — Philips Semiconductors reserves the right to make changes in the products - including circuits, standard cells, and/or software - described or contained herein in order to improve design and/or performance. When the product is in full production (status 'Production'), relevant changes will be communicated via a Customer Product/Process Change Notification (CPCN). Philips Semiconductors assumes no responsibility or liability for the use of any of these products, conveys no license or title under any patent, copyright, or mask work right to these products, and makes no representations or warranties that these products are free from patent, copyright, or mask work right infringement, unless otherwise specified.

14. Contact information

For additional information, please visit: <http://www.semiconductors.philips.com>

For sales office addresses, send an email to: sales.addresses@www.semiconductors.philips.com

15. Contents

| | | |
|-----------|--------------------------------------|-----------|
| 1 | Product profile | 1 |
| 1.1 | General description | 1 |
| 1.2 | Features | 1 |
| 1.3 | Applications | 1 |
| 1.4 | Quick reference data | 1 |
| 2 | Pinning information | 2 |
| 3 | Ordering information | 2 |
| 4 | Marking | 2 |
| 5 | Limiting values | 2 |
| 6 | Thermal characteristics | 3 |
| 7 | Characteristics | 4 |
| 8 | Application information | 7 |
| 9 | Package outline | 8 |
| 10 | Revision history | 9 |
| 11 | Data sheet status | 10 |
| 12 | Definitions | 10 |
| 13 | Disclaimers | 10 |
| 14 | Contact information | 10 |



© Koninklijke Philips Electronics N.V. 2004

All rights are reserved. Reproduction in whole or in part is prohibited without the prior written consent of the copyright owner. The information presented in this document does not form part of any quotation or contract, is believed to be accurate and reliable and may be changed without notice. No liability will be accepted by the publisher for any consequence of its use. Publication thereof does not convey nor imply any license under patent- or other industrial or intellectual property rights.

Date of release: 26 May 2004
Document order number: 9397 750 12751

Published in The Netherlands