

# ANTREX Electronics

## Electronic Components Sourcing Information

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### Product Reference Information

**Part Number:** PMEM4020APD,115  
**Manufacturer:** NXP USA Inc.  
**Package:** SC-74, SOT-457  
**Availability:** Please confirm with sales

**Product Page:**

<https://antrexco.com/product/details/nxp-usa-inc/pmem4020apd-115.html>

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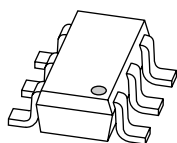
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**Note:**

This PDF includes an ANTREX product reference cover page.

The original manufacturer datasheet follows from the next page.



# PMEM4020APD

## PNP transistor/Schottky rectifier module

Rev. 02 — 31 August 2009

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 SOT457 (SC-74) small plastic package. NPN complement: PMEM4020AND

### 1.2 Features

- 600 mW total power dissipation
- High current capability up to 2 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 |
|-----------------------|---------------------------|--------------------------------------------|-----------------------|-----|-----|------|
| <b>PNP transistor</b> |                           |                                            |                       |     |     |      |
| $V_{CEO}$             | collector-emitter voltage | open base                                  | -                     | -   | -40 | V    |
| $I_C$                 | collector current (DC)    | continuous;<br>$T_s \leq 55^\circ\text{C}$ | <a href="#">[1]</a> - | -   | -2  | A    |

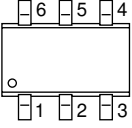
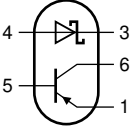
Table 1. Quick reference data ...continued

| Symbol                            | Parameter                  | Conditions | Min | Typ | Max | Unit |
|-----------------------------------|----------------------------|------------|-----|-----|-----|------|
| <b>Schottky barrier rectifier</b> |                            |            |     |     |     |      |
| $V_R$                             | continuous reverse voltage |            | -   | -   | 40  | V    |
| $I_F$                             | continuous forward current |            | -   | -   | 1   | A    |

[1] Soldering point of collector or cathode tab.

## 2. Pinning information

Table 2. Discrete pinning

| Pin | Description   | Simplified outline                                                                  | Symbol                                                                                        |
|-----|---------------|-------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------|
| 1   | emitter       |  | <br>sym040 |
| 2   | not connected |                                                                                     |                                                                                               |
| 3   | cathode       |                                                                                     |                                                                                               |
| 4   | anode         |                                                                                     |                                                                                               |
| 5   | base          |                                                                                     |                                                                                               |
| 6   | collector     |                                                                                     |                                                                                               |

## 3. Ordering information

Table 3. Ordering information

| Type number | Package |                                          |         |
|-------------|---------|------------------------------------------|---------|
|             | Name    | Description                              | Version |
| PMEM4020APD | SC-74   | plastic surface mounted package; 6 leads | SOT457  |

## 4. Marking

Table 4. Marking

| Type number | Marking code |
|-------------|--------------|
| PMEM4020APD | D3           |

## 5. Limiting values

Table 5. Limiting values

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

| Symbol                | Parameter                 | Conditions     | Min | Max | Unit |
|-----------------------|---------------------------|----------------|-----|-----|------|
| <b>PNP transistor</b> |                           |                |     |     |      |
| $V_{CBO}$             | collector-base voltage    | open emitter   | -   | -40 | V    |
| $V_{CEO}$             | collector-emitter voltage | open base      | -   | -40 | V    |
| $V_{EBO}$             | emitter-base voltage      | open collector | -   | -5  | V    |

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

| Symbol                            | Parameter                           | Conditions                                         | Min     | Max   | Unit             |
|-----------------------------------|-------------------------------------|----------------------------------------------------|---------|-------|------------------|
| $I_C$                             | collector current (DC)              | continuous                                         | [1] -   | -0.75 | A                |
|                                   |                                     | continuous                                         | [2] -   | -1    | A                |
|                                   |                                     | continuous                                         | [3] -   | -1.3  | A                |
|                                   |                                     | continuous;<br>$T_s \leq 55\text{ }^\circ\text{C}$ | [4] -   | -2    | A                |
| $I_{CM}$                          | peak collector current              |                                                    | -       | -3    | A                |
| $I_{BM}$                          | peak base current                   |                                                    | -       | -1    | A                |
| $P_{tot}$                         | total power dissipation             | $T_{amb} \leq 25\text{ }^\circ\text{C}$            | [1] -   | 295   | mW               |
|                                   |                                     | $T_{amb} \leq 25\text{ }^\circ\text{C}$            | [2] -   | 400   | mW               |
|                                   |                                     | $T_{amb} \leq 25\text{ }^\circ\text{C}$            | [3] -   | 500   | mW               |
|                                   |                                     | $T_s \leq 55\text{ }^\circ\text{C}$                | [4] -   | 1000  | mW               |
| $T_j$                             | junction temperature                |                                                    | -       | 150   | $^\circ\text{C}$ |
| <b>Schottky barrier rectifier</b> |                                     |                                                    |         |       |                  |
| $V_R$                             | continuous reverse voltage          |                                                    | -       | 40    | V                |
| $I_F$                             | continuous forward voltage          |                                                    | -       | 1     | A                |
| $I_{FRM}$                         | repetitive peak forward current     | $t_p \leq 1\text{ ms}; \delta \leq 0.5$            | -       | 3.5   | A                |
| $I_{FSM}$                         | non-repetitive peak forward current | $t = 8\text{ ms}; \text{square wave}$              | -       | 10    | A                |
| $P_{tot}$                         | total power dissipation             | $T_{amb} \leq 25\text{ }^\circ\text{C}$            | [1] -   | 295   | mW               |
|                                   |                                     | $T_{amb} \leq 25\text{ }^\circ\text{C}$            | [2] -   | 400   | mW               |
|                                   |                                     | $T_{amb} \leq 25\text{ }^\circ\text{C}$            | [3] -   | 500   | mW               |
|                                   |                                     | $T_s \leq 55\text{ }^\circ\text{C}$                | [4] -   | 1000  | mW               |
| $T_j$                             | junction temperature                |                                                    | [2] -   | 150   | $^\circ\text{C}$ |
| <b>Combined device</b>            |                                     |                                                    |         |       |                  |
| $P_{tot}$                         | total power dissipation             | $T_{amb} \leq 25\text{ }^\circ\text{C}$            | [2] -   | 600   | mW               |
| $T_{stg}$                         | storage temperature                 |                                                    | -65     | +150  | $^\circ\text{C}$ |
| $T_{amb}$                         | ambient temperature                 |                                                    | [2] -65 | +150  | $^\circ\text{C}$ |

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

[2] Device mounted on a printed-circuit board, single-sided copper, tin-plated, 1 cm<sup>2</sup> mounting pad for both collector and cathode.

[3] Mounted on a ceramic printed-circuit board, single-sided copper, tin-plated, standard footprint.

[4] Soldering point of collector or cathode tab.

## 6. Thermal characteristics

Table 6. Thermal characteristics<sup>[1]</sup>

| Symbol               | Parameter                                           | Conditions  | Min   | Typ | Max | Unit |
|----------------------|-----------------------------------------------------|-------------|-------|-----|-----|------|
| Single device        |                                                     |             |       |     |     |      |
| R <sub>th(j-s)</sub> | thermal resistance from junction to soldering point | in free air | [2] - | -   | 95  | K/W  |
| R <sub>th(j-a)</sub> | thermal resistance from junction to ambient         | in free air | [3] - | -   | 250 | K/W  |
|                      |                                                     |             | [4] - | -   | 315 | K/W  |
|                      |                                                     |             | [5] - | -   | 425 | K/W  |
| Combined device      |                                                     |             |       |     |     |      |
| R <sub>th(j-a)</sub> | thermal resistance from junction to ambient         | in free air | [3] - | -   | 208 | 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] Soldering point of collector or cathode tab.

[3] Mounted on a ceramic printed-circuit board, single-sided copper, tin-plated, standard footprint.

[4] Device mounted on a printed-circuit board, single-sided copper, tin-plated, 1 cm<sup>2</sup> mounting pad for both collector and cathode tab.

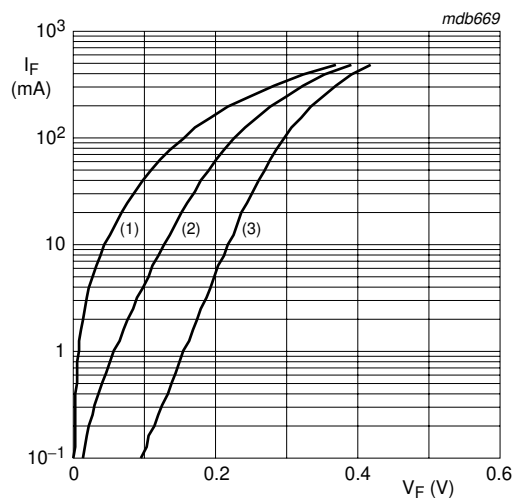
[5] Mounted on a FR4 printed-circuit board, single-sided copper, tin-plated, standard footprint.

## 7. Characteristics

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

| Symbol                            | Parameter                            | Conditions                                                                   | Min    | Typ | Max  | Unit             |
|-----------------------------------|--------------------------------------|------------------------------------------------------------------------------|--------|-----|------|------------------|
| <b>PNP transistor</b>             |                                      |                                                                              |        |     |      |                  |
| $I_{CBO}$                         | collector-base cut-off current       | $V_{CB} = -40\text{ V}; I_E = 0\text{ A}$                                    | -      | -   | -100 | nA               |
|                                   |                                      | $V_{CB} = -40\text{ V}; I_E = 0\text{ A}; T_j = 150\text{ }^{\circ}\text{C}$ | -      | -   | -50  | $\mu\text{A}$    |
| $I_{CEO}$                         | collector-emitter cut-off current    | $V_{CE} = -30\text{ V}; I_B = 0\text{ A}$                                    | -      | -   | -100 | nA               |
| $I_{EBO}$                         | emitter-base cut-off current         | $V_{EB} = -5\text{ V}; I_C = 0\text{ A}$                                     | -      | -   | -100 | nA               |
| $h_{FE}$                          | DC current gain                      | $V_{CE} = -5\text{ V}; I_C = -1\text{ mA}$                                   | 300    | -   | -    |                  |
|                                   |                                      | $V_{CE} = -5\text{ V}; I_C = -100\text{ mA}$                                 | 300    | -   | -    |                  |
|                                   |                                      | $V_{CE} = -5\text{ V}; I_C = -500\text{ mA}$                                 | 250    | -   | 900  |                  |
|                                   |                                      | $V_{CE} = -5\text{ V}; I_C = -1\text{ A}$                                    | 160    | -   | -    |                  |
|                                   |                                      | $V_{CE} = -5\text{ V}; I_C = -2\text{ A}$                                    | [1] 50 | -   | -    |                  |
| $V_{CEsat}$                       | collector-emitter saturation voltage | $I_C = -100\text{ mA}; I_B = -1\text{ mA}$                                   | -      | -   | -120 | mV               |
|                                   |                                      | $I_C = -500\text{ mA}; I_B = -50\text{ mA}$                                  | -      | -   | -145 | mV               |
|                                   |                                      | $I_C = -1\text{ A}; I_B = -100\text{ mA}$                                    | -      | -   | -260 | mV               |
|                                   |                                      | $I_C = -2\text{ A}; I_B = -200\text{ mA}$                                    | -      | -   | -530 | mV               |
| $R_{CEsat}$                       | equivalent on-resistance             | $I_C = -1\text{ A}; I_B = -100\text{ mA}$                                    | [1] -  | 180 | 280  | $\text{m}\Omega$ |
| $V_{BEsat}$                       | base-emitter saturation voltage      | $I_C = -1\text{ A}; I_B = -100\text{ mA}$                                    | [1] -  | -   | -1.1 | V                |
| $V_{BEon}$                        | base-emitter turn-on voltage         | $V_{CE} = -5\text{ V}; I_C = -1\text{ A}$                                    | [1] -  | -   | -1.0 | V                |
| $f_T$                             | transition frequency                 | $V_{CE} = -10\text{ V}; I_C = -50\text{ mA}; f = 100\text{ MHz}$             | 150    | -   | -    | MHz              |
| $C_c$                             | collector capacitance                | $V_{CB} = -10\text{ V}; I_E = i_e = 0\text{ A}; f = 1\text{ MHz}$            | -      | -   | 10   | pF               |
| <b>Schottky barrier rectifier</b> |                                      |                                                                              |        |     |      |                  |
| $V_F$                             | continuous forward voltage           | see <a href="#">Figure 1</a>                                                 |        |     |      |                  |
|                                   |                                      | $I_F = 0.1\text{ mA}$                                                        | [1] -  | 95  | 130  | mV               |
|                                   |                                      | $I_F = 1\text{ mA}$                                                          | [1] -  | 155 | 210  | mV               |
|                                   |                                      | $I_F = 10\text{ mA}$                                                         | [1] -  | 220 | 270  | mV               |
|                                   |                                      | $I_F = 100\text{ mA}$                                                        | [1] -  | 295 | 350  | mV               |
|                                   |                                      | $I_F = 1000\text{ mA}$                                                       | [1] -  | 540 | 640  | mV               |
| $I_R$                             | reverse current                      | see <a href="#">Figure 2</a>                                                 |        |     |      |                  |
|                                   |                                      | $V_R = 10\text{ V}$                                                          | [1] -  | 7   | 20   | $\mu\text{A}$    |
|                                   |                                      | $V_R = 40\text{ V}$                                                          | [1] -  | 30  | 100  | $\mu\text{A}$    |
| $C_d$                             | diode capacitance                    | $V_R = 1\text{ V}; f = 1\text{ MHz};$<br>see <a href="#">Figure 3</a>        | -      | 43  | 48   | pF               |

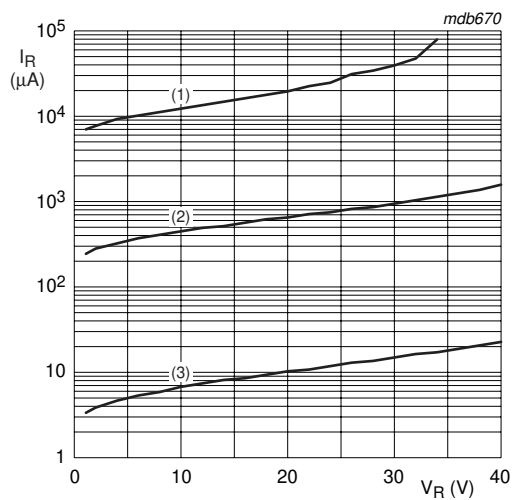
[1] Pulse test:  $t_p \leq 300\text{ }\mu\text{s}; \delta \leq 0.02$



Schottky barrier rectifier

- (1)  $T_{amb} = 150\text{ }^{\circ}\text{C}$
- (2)  $T_{amb} = 85\text{ }^{\circ}\text{C}$
- (3)  $T_{amb} = 25\text{ }^{\circ}\text{C}$

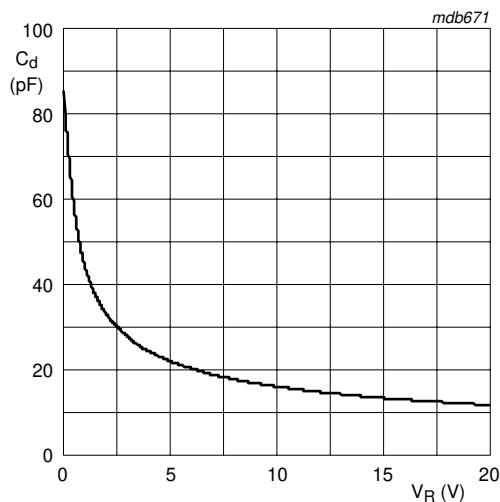
Fig 1. Forward current as a function of forward voltage; typical values



Schottky barrier rectifier

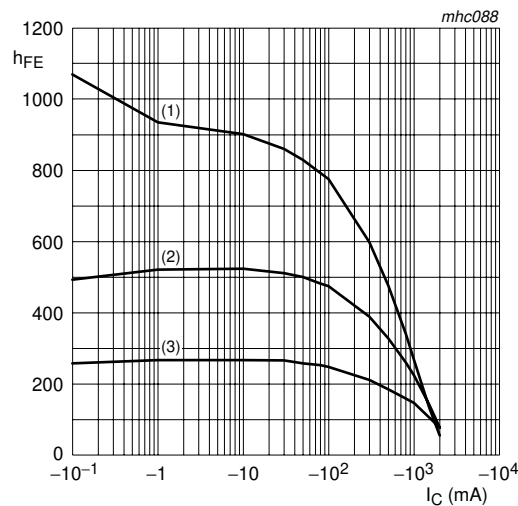
- (1)  $T_{amb} = 150\text{ }^{\circ}\text{C}$
- (2)  $T_{amb} = 85\text{ }^{\circ}\text{C}$
- (3)  $T_{amb} = 25\text{ }^{\circ}\text{C}$

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



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

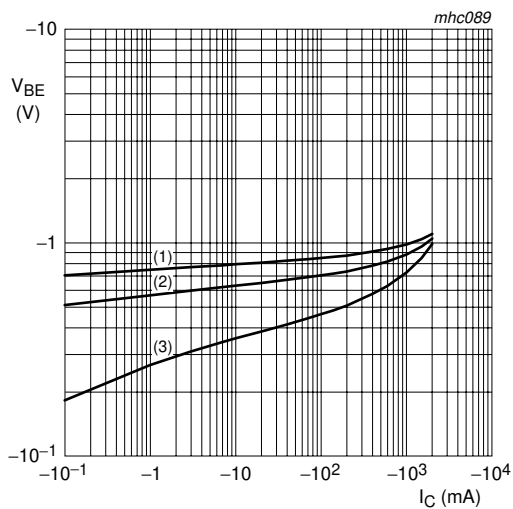
Fig 3. Diode capacitance as a function of reverse voltage; typical values



PNP transistor;  $V_{CE} = -5\text{ V}$

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

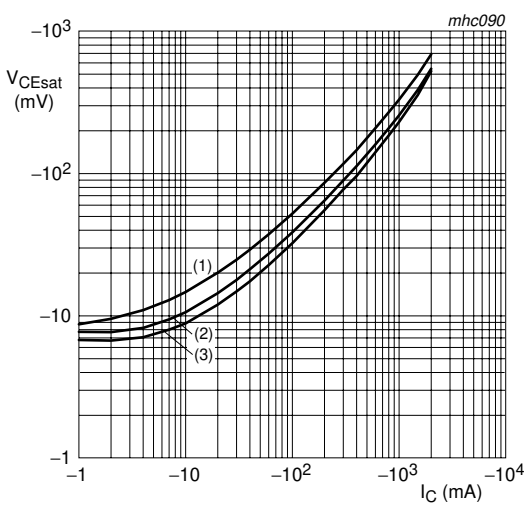
Fig 4. DC current gain as a function of collector current; typical values



PNP transistor;  $V_{CE} = -5\text{ V}$

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

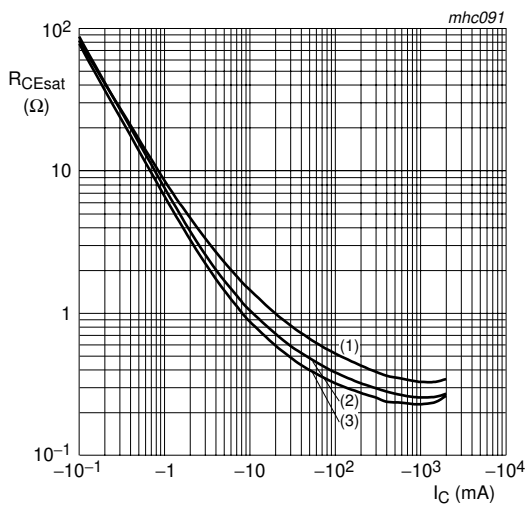
Fig 5. Base-emitter voltage as a function of collector current; typical values



PNP transistor;  $I_C/I_B = 10$

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

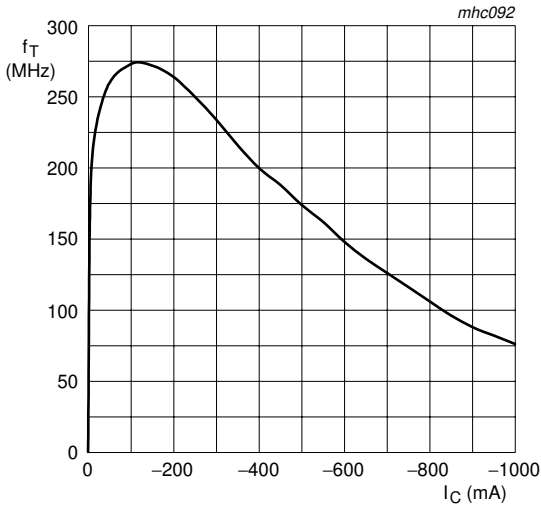
Fig 6. Collector-emitter saturation voltage as a function of collector current; typical values



PNP transistor;  $I_C/I_B = 10$

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

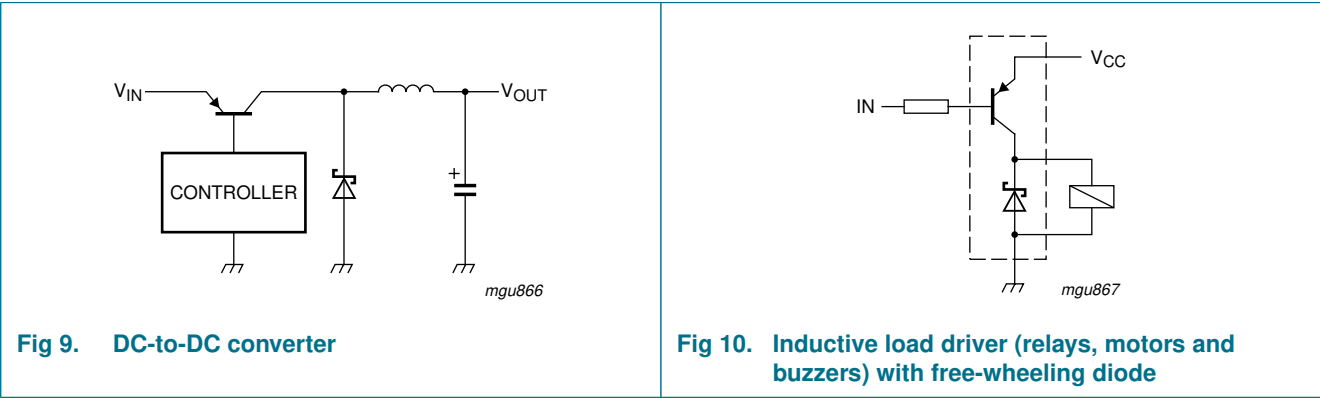
Fig 7. Equivalent on-resistance as a function of collector current; typical values



PNP transistor;  $V_{CE} = -10\text{ V}$

Fig 8. Transition frequency as a function of collector current

8. Application information



9. Package outline

Plastic surface-mounted package (TSOP6); 6 leads

SOT457

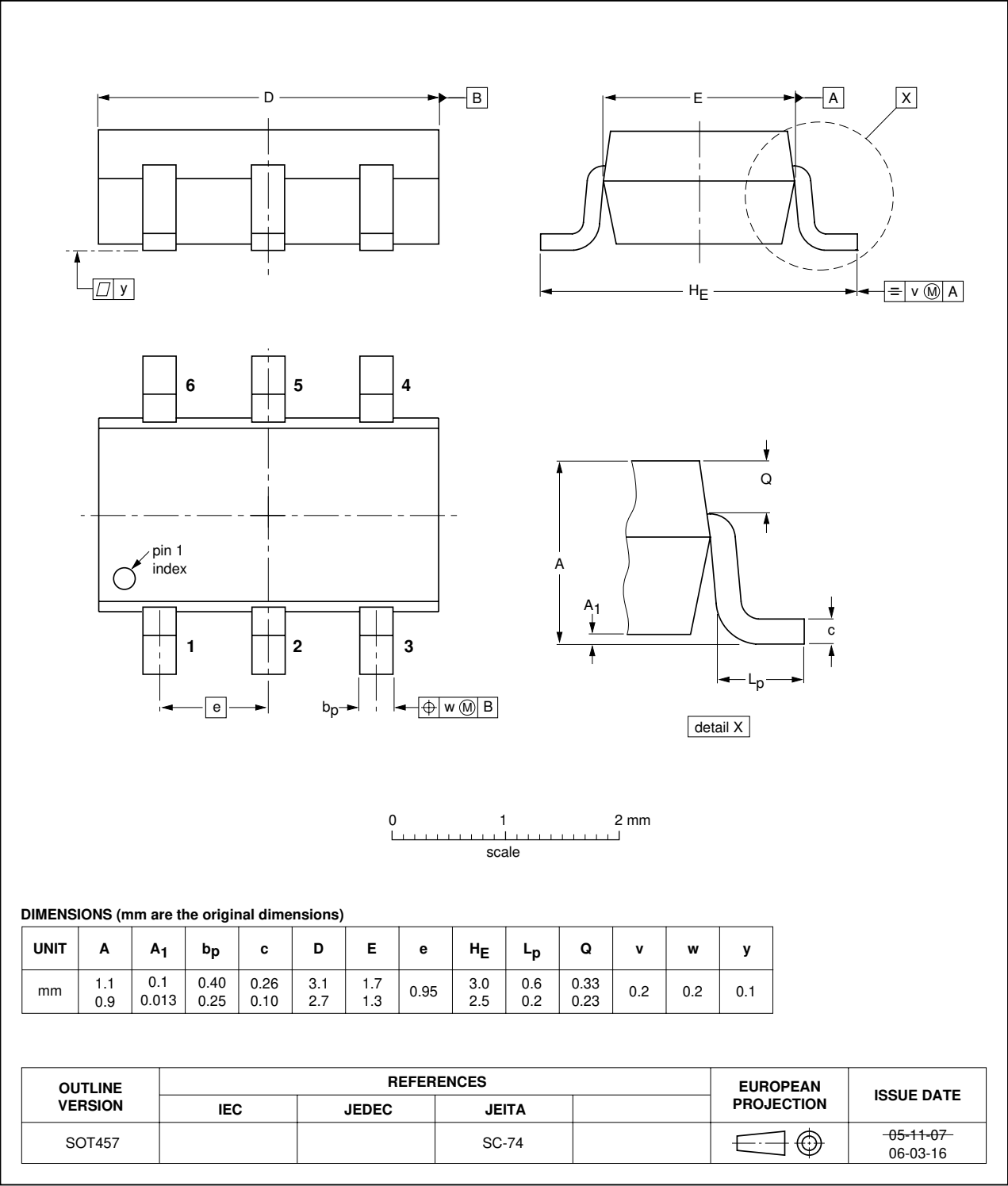


Fig 11. Package outline SOT457 (SC-74)

## 10. Packing information

**Table 8. Packing methods**

The indicated -xxx are the last three digits of the 12NC ordering code.<sup>[1]</sup>

| Type number | Package | Description                        | Packing quantity |       |
|-------------|---------|------------------------------------|------------------|-------|
|             |         |                                    | 3000             | 10000 |
| PMEM4020APD | SOT457  | 4 mm pitch, 8 mm tape and reel; T1 | -115             | -135  |
|             |         | 4 mm pitch, 8 mm tape and reel; T2 | -125             | -165  |

[1] For further information and the availability of packing methods, see [Section 13](#).

## 11. Revision history

**Table 9.** Revision history

| Document ID                                                                                                                                                                                                                                                                                                                                                                   | Release date | Data sheet status  | Change notice | Supersedes    |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|--------------------|---------------|---------------|
| PMEM4020APD_2                                                                                                                                                                                                                                                                                                                                                                 | 20090831     | Product data sheet | -             | PMEM4020APD_1 |
| Modifications:                                                                                                                                                                                                                                                                                                                                                                |              |                    |               |               |
| <ul style="list-style-type: none"><li>• This data sheet was changed to reflect the new company name NXP Semiconductors, including new legal definitions and disclaimers. No changes were made to the technical content.</li><li>• <a href="#">Table 2 “Discrete pinning”</a>: amended</li><li>• <a href="#">Figure 11 “Package outline SOT457 (SC-74)”</a>: updated</li></ul> |              |                    |               |               |
| PMEM4020APD_1                                                                                                                                                                                                                                                                                                                                                                 | 20041004     | Product data sheet | -             | -             |

## 12. Legal information

### 12.1 Data sheet status

| Document status <sup>[1][2]</sup> | Product status <sup>[3]</sup> | Definition                                                                            |
|-----------------------------------|-------------------------------|---------------------------------------------------------------------------------------|
| Objective [short] data sheet      | Development                   | This document contains data from the objective specification for product development. |
| Preliminary [short] data sheet    | Qualification                 | This document contains data from the preliminary specification.                       |
| Product [short] data sheet        | Production                    | This document contains the product specification.                                     |

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

[2] The term 'short data sheet' is explained in section "Definitions".

[3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the Internet at URL <http://www.nxp.com>.

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## 13. Contact information

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14. 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..... 4

7 Characteristics..... 5

8 Application information..... 8

9 Package outline ..... 9

10 Packing information..... 10

11 Revision history..... 11

12 Legal information..... 12

12.1 Data sheet status ..... 12

12.2 Definitions..... 12

12.3 Disclaimers..... 12

12.4 Trademarks..... 12

13 Contact information..... 12

14 Contents ..... 13



Please be aware that important notices concerning this document and the product(s) described herein, have been included in section 'Legal information'.