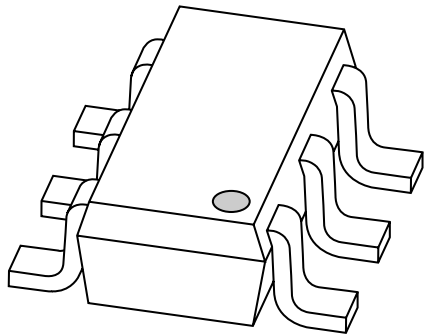


DATA SHEET



PMEM4020ND NPN transistor/Schottky-diode module

Product specification

2003 Nov 10

NPN transistor/Schottky-diode module

PMEM4020ND

FEATURES

- 600 mW total power dissipation
- High current capability
- Reduces required PCB area
- Reduced 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.

APPLICATIONS

- DC-to-DC converters
- Inductive load drivers
- MOSFET drivers.

DESCRIPTION

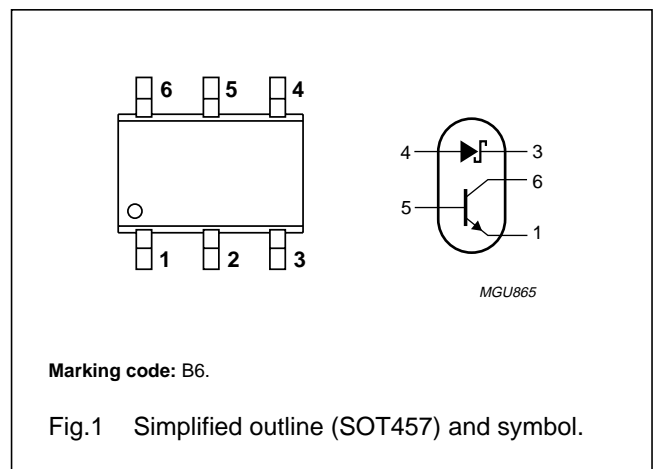
Combination of an NPN transistor with low V_{CEsat} and high current capability and a planar Schottky barrier diode with an integrated guard ring for stress protection in a SOT457 (SC-74) small plastic package.
PNP complement: PMEM4020PD.

ORDERING INFORMATION

TYPE NUMBER	PACKAGE		
	NAME	DESCRIPTION	VERSION
PMEM4020ND	–	plastic surface mounted package; 6 leads	SOT457

PINNING

PIN	DESCRIPTION
1	emitter
2	not connected
3	cathode
4	anode
5	base
6	collector



NPN transistor/Schottky-diode module

PMEM4020ND

LIMITING VALUES

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
NPN transistor					
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
I _C	collector current (DC)	note 1	–	0.95	A
		note 2	–	1.30	A
		note 3	–	1.65	A
		T _s ≤ 55 °C; note 4	–	2.0	A
I _{CM}	peak collector current		–	3	A
I _{BM}	peak base current		–	1	A
P _{tot}	total power dissipation	T _{amb} ≤ 25 °C; note 1	–	295	mW
		T _{amb} ≤ 25 °C; note 2	–	400	mW
		T _{amb} ≤ 25 °C; note 3	–	500	mW
		T _s ≤ 55 °C; note 4	–	1000	mW
T _j	junction temperature		–	150	°C
Schottky barrier diode					
V _R	continuous reverse voltage		–	20	V
I _F	continuous forward current		–	1	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; note 1	–	295	mW
		T _{amb} ≤ 25 °C; note 2	–	400	mW
		T _{amb} ≤ 25 °C; note 3	–	500	mW
		T _s ≤ 55 °C; note 4	–	1000	mW
T _j	junction temperature	note 2	–	150	°C
Combined device					
P _{tot}	total power dissipation	T _{amb} = 25 °C; note 2	–	600	mW
T _{stg}	storage temperature		–65	+150	°C
T _{amb}	operating ambient temperature	note 2	–65	+150	°C

Notes

1. Device mounted on a FR4 printed-circuit board; single-sided copper; tinplated; standard footprint for SOT457.
2. Device mounted on a FR4 printed-circuit board; single-sided copper; tinplated; mounting pads for collector and cathode both 1 cm².
3. Device mounted on a ceramic printed-circuit board, single-sided copper; tinplated; standard footprint.
4. Solder point of collector or cathode tab.

NPN transistor/Schottky-diode module

PMEM4020ND

THERMAL CHARACTERISTICS

SYMBOL	PARAMETER	CONDITIONS	VALUE	UNIT
Single device				
$R_{th\ j-s}$	thermal resistance from junction to solder point	in free air; notes 1 and 2	95	K/W
$R_{th\ j-a}$	thermal resistance from junction to ambient	in free air; notes 1 and 3	250	K/W
		in free air; notes 1 and 4	315	K/W
		in free air; notes 1 and 5	425	K/W
Combined device				
$R_{th\ j-a}$	thermal resistance from junction to ambient	in free air; notes 1 and 3	208	K/W

Notes

1. For Schottky barrier diodes 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 determination of 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 ceramic printed-circuit board; single-sided copper; tinplated; standard footprint.
4. Device mounted on a FR4 printed-circuit board, single-sided copper; tinplated; mounting pad for collector and cathode 1 cm²/each.
5. Device mounted on a FR4 printed-circuit board; single-sided copper; tinplated; standard footprint for SOT457.

NPN transistor/Schottky-diode module

PMEM4020ND

ELECTRICAL CHARACTERISTICST_{amb} = 25 °C unless otherwise specified.

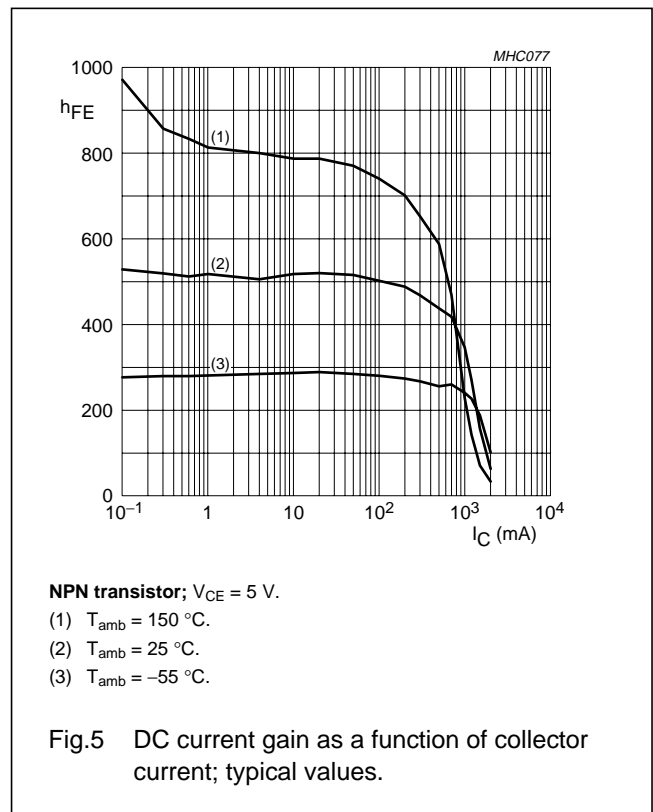
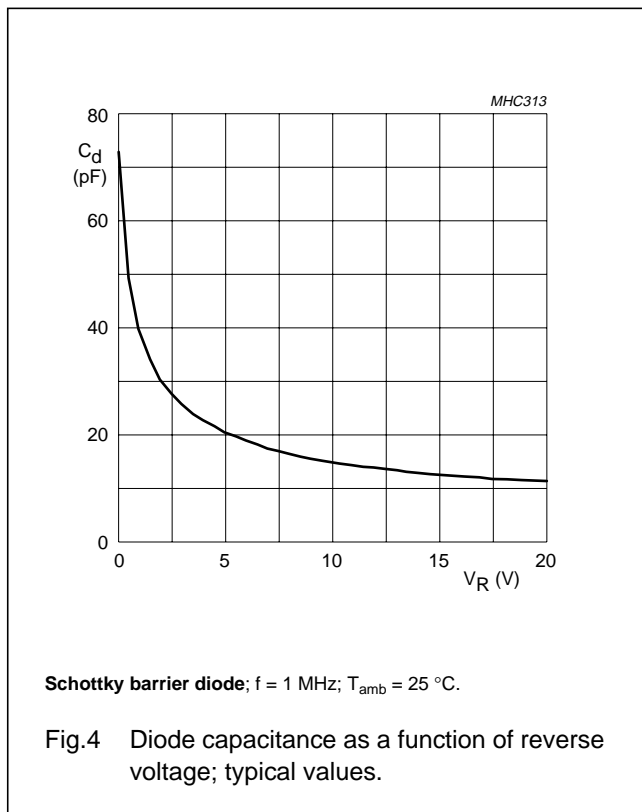
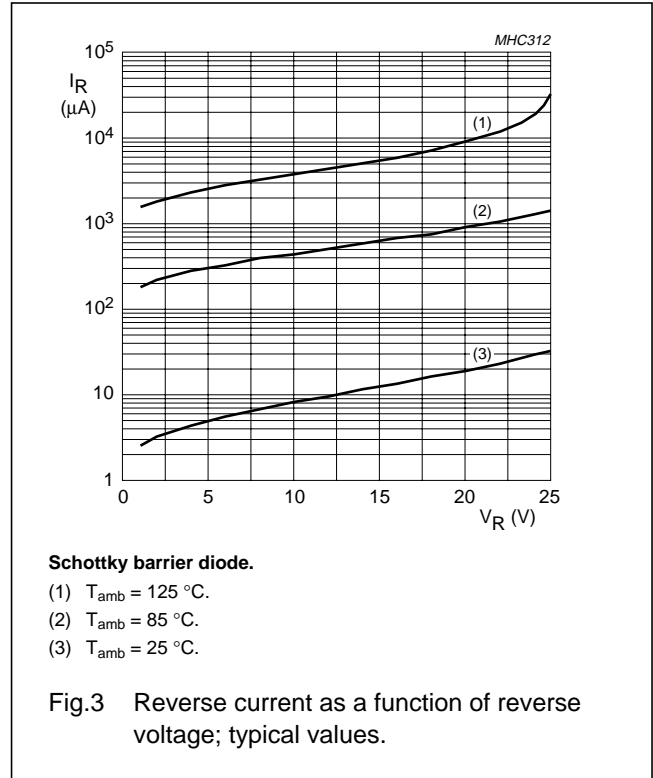
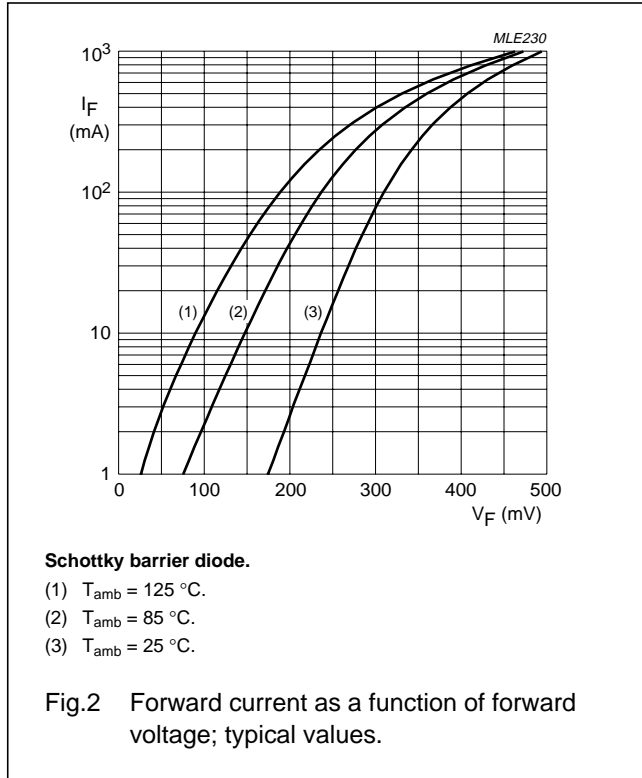
SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
NPN transistor						
I _{CBO}	collector-base cut-off current	V _{CB} = 40 V; I _E = 0	–	–	100	nA
		V _{CB} = 40 V; I _E = 0; T _{amb} = 150 °C	–	–	50	μA
I _{CEO}	collector-emitter cut-off current	V _{CE} = 30 V; I _B = 0	–	–	100	nA
I _{EBO}	emitter-base cut-off current	V _{EB} = 5 V; I _C = 0	–	–	100	nA
h _{FE}	current gain (DC)	V _{CE} = 5 V; I _C = 1 mA	300	–	–	
		V _{CE} = 5 V; I _C = 500 mA	300	–	900	
		V _{CE} = 5 V; I _C = 1 A	200	–	–	
		V _{CE} = 5 V; I _C = 2 A; note 1	75	–	–	
V _{CEsat}	collector-emitter saturation voltage	I _C = 100 mA; I _B = 1 mA	–	–	75	mV
		I _C = 500 mA; I _B = 50 mA	–	–	100	mV
		I _C = 1 A; I _B = 100 mA	–	–	190	mV
		I _C = 2 A; I _B = 200 mA	–	–	400	mV
V _{BEsat}	base-emitter saturation voltage	I _C = 1 A; I _B = 100 mA	–	–	1.2	V
R _{CEsat}	equivalent on-resistance	I _C = 1 A; I _B = 100 mA; note 1	–	150	190	mΩ
V _{BEon}	base-emitter turn-on voltage	V _{CE} = 5 V; I _C = 1 A	–	–	1.1	V
f _T	transition frequency	I _C = 50 mA; V _{CE} = 10 V; f = 100 MHz	150	–	–	MHz
C _c	collector capacitance	V _{CB} = 10 V; I _E = 0; i _e = 0; f = 1 MHz	–	–	10	pF
Schottky barrier diode						
V _F	continuous forward voltage	see Fig.2; note 1	–	–	–	–
		I _F = 10 mA	–	240	270	mV
		I _F = 100 mA	–	300	350	mV
I _R	reverse current	see Fig.3; note 1	–	–	–	–
		V _R = 5 V	–	5	10	μA
		V _R = 8 V	–	7	20	μA
C _d	diode capacitance	V _R = 15 V	–	10	50	μA
		V _R = 5 V; f = 1 MHz; see Fig.4	–	19	25	pF

Note1. Pulse test: t_p ≤ 300 μs; δ ≤ 0.02.

NPN transistor/Schottky-diode module

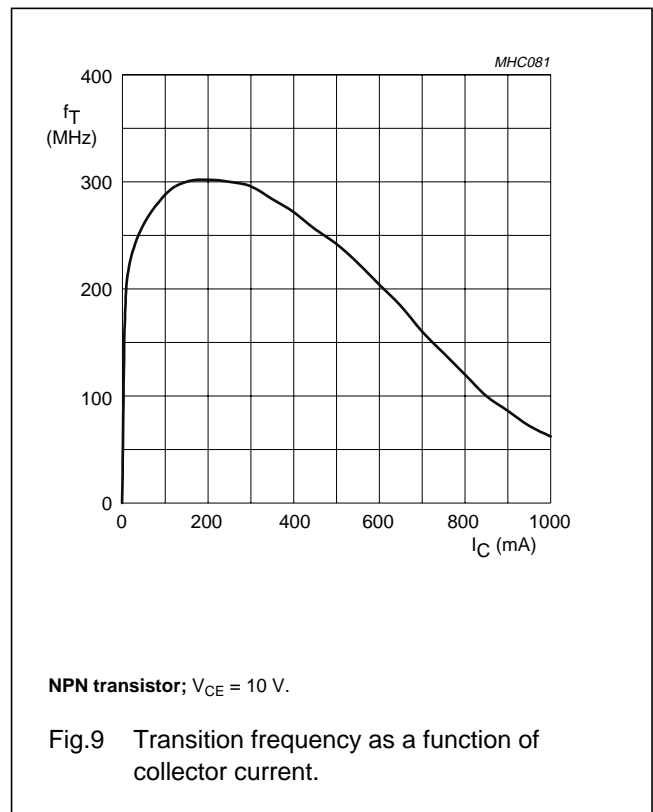
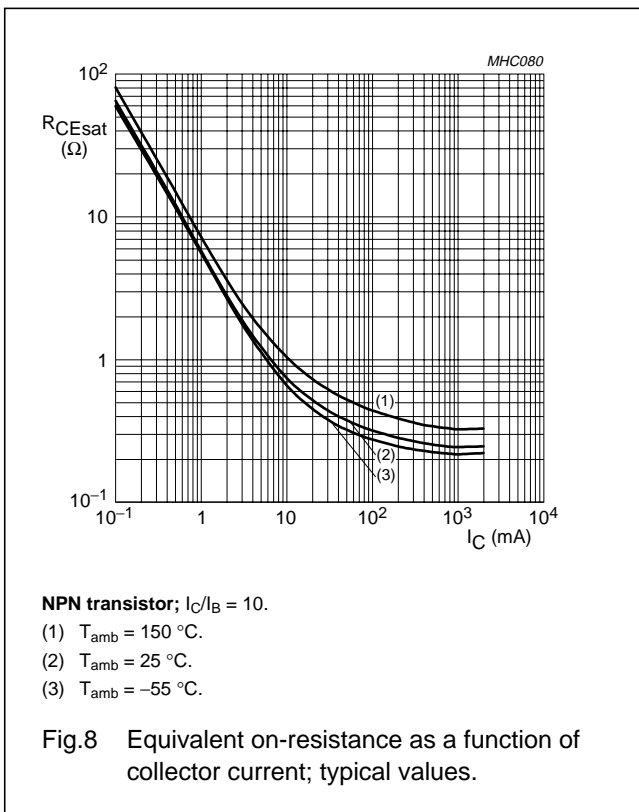
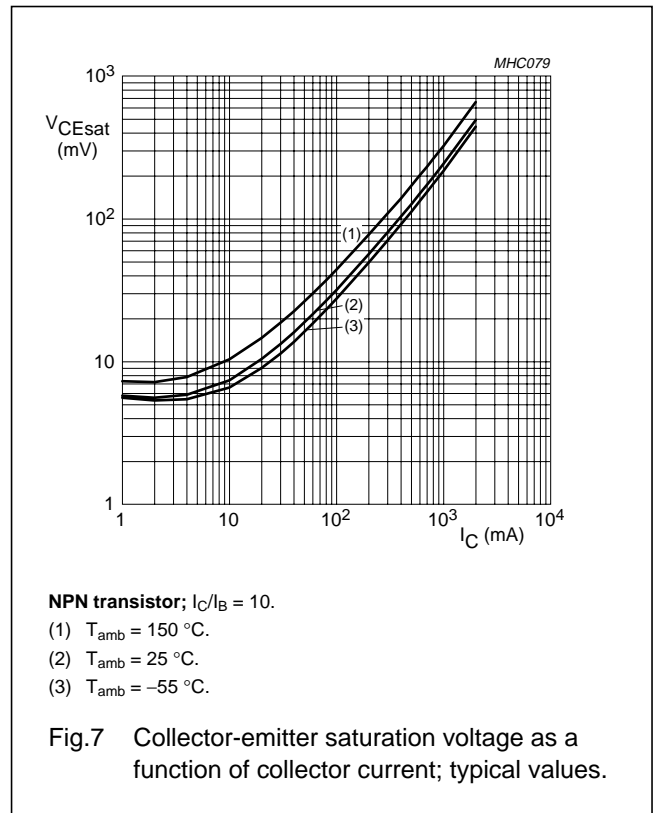
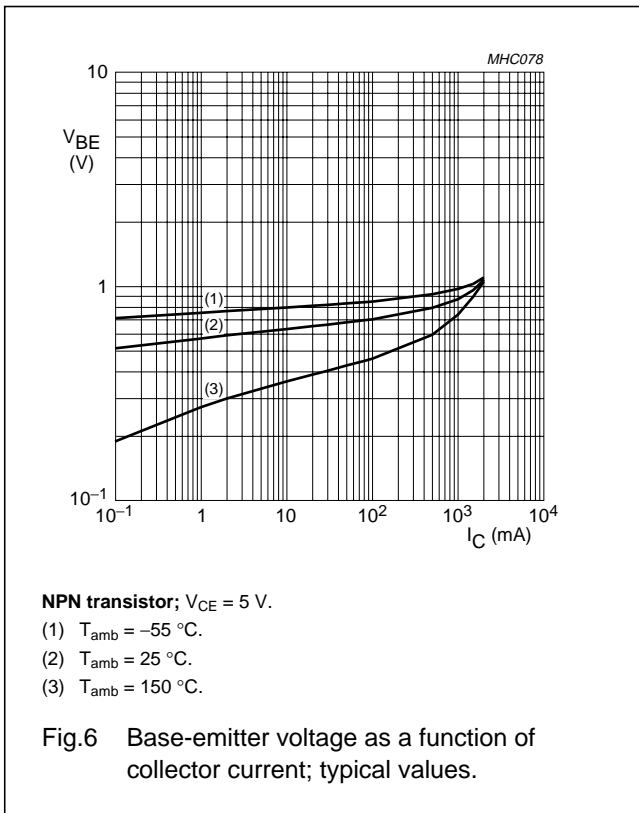
PMEM4020ND

GRAPHICAL DATA



NPN transistor/Schottky-diode module

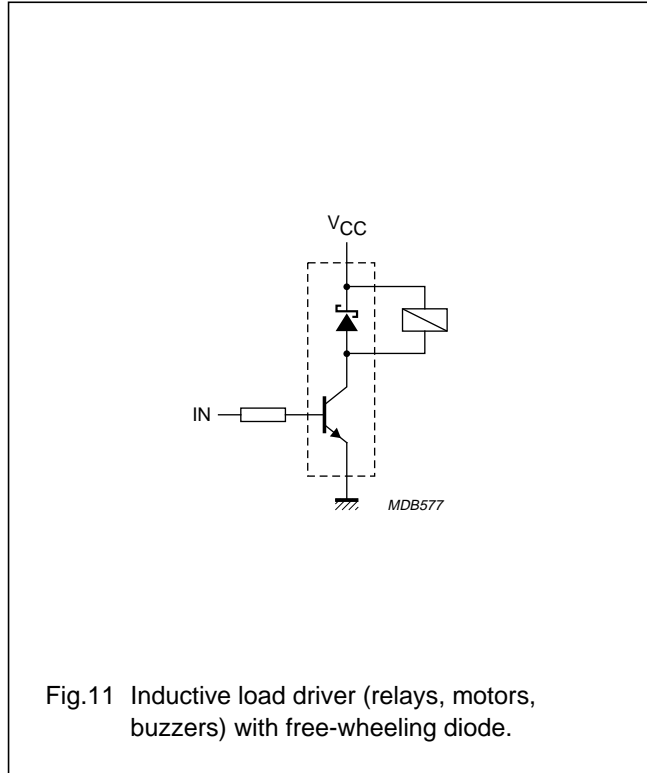
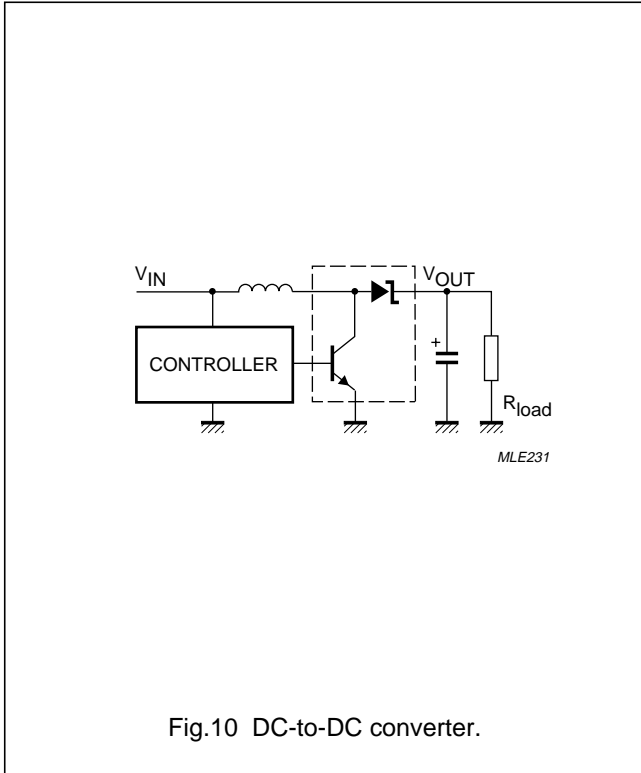
PMEM4020ND



NPN transistor/Schottky-diode module

PMEM4020ND

APPLICATION INFORMATION



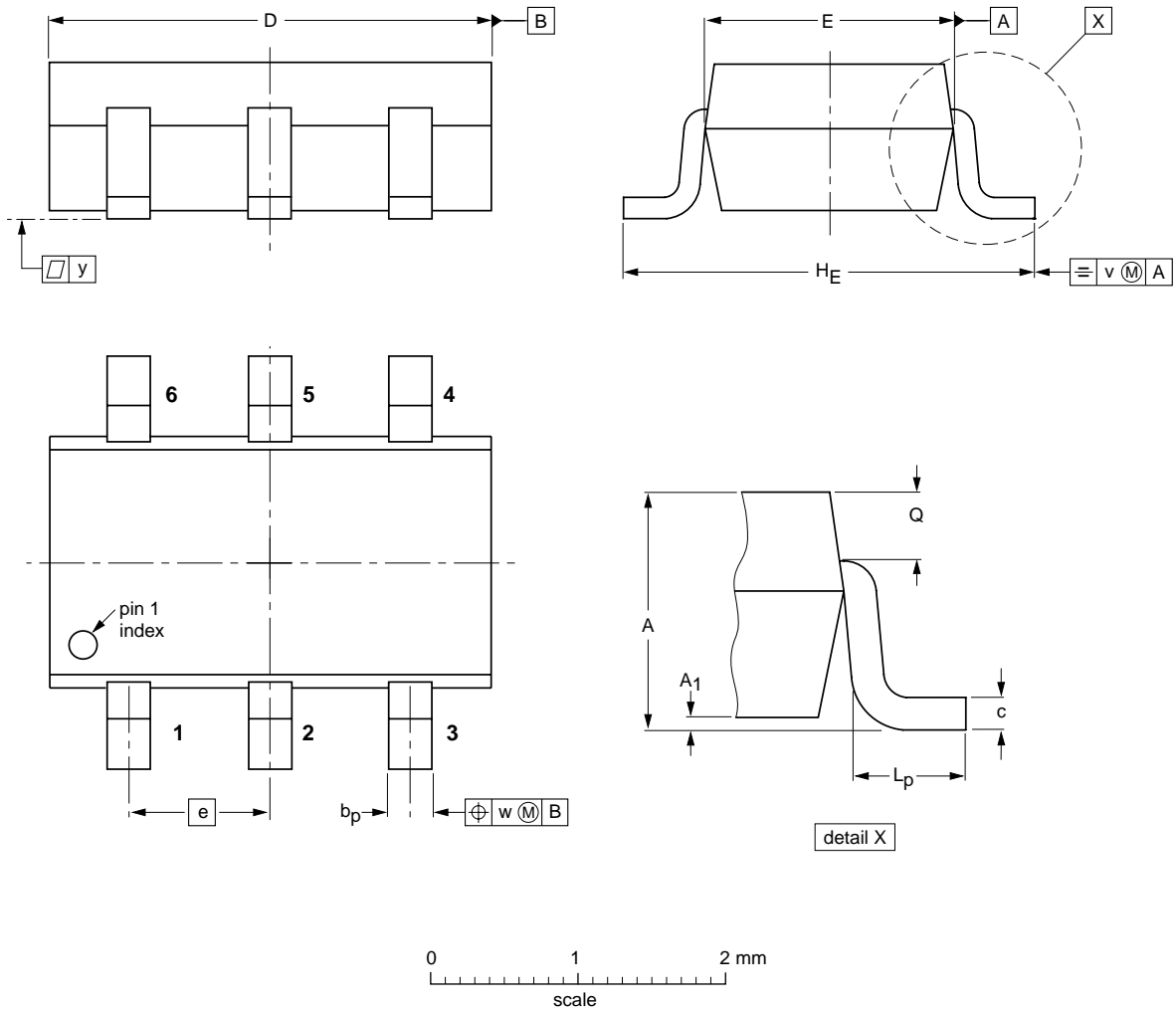
NPN transistor/Schottky-diode module

PMEM4020ND

PACKAGE OUTLINE

Plastic surface mounted package; 6 leads

SOT457



DIMENSIONS (mm are the original dimensions)

UNIT	A	A ₁	b _p	c	D	E	e	H _E	L _p	Q	v	w	y
mm	1.1 0.9	0.1 0.013	0.40 0.25	0.26 0.10	3.1 2.7	1.7 1.3	0.95	3.0 2.5	0.6 0.2	0.33 0.23	0.2	0.2	0.1

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT457			SC-74			-97-02-28- 01-05-04

NPN transistor/Schottky-diode module

PMEM4020ND

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).

Notes

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.

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.

DISCLAIMERS

Life support applications — 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 licence 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.

Philips Semiconductors – a worldwide company

Contact information

For additional information please visit <http://www.semiconductors.philips.com>. Fax: +31 40 27 24825

For sales offices addresses send e-mail to: sales.addresses@www.semiconductors.philips.com.

© Koninklijke Philips Electronics N.V. 2003

SCA75

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.

Printed in The Netherlands

R76/01/pp11

Date of release: 2003 Nov 10

Document order number: 9397 750 11906

Let's make things better.

**Philips
Semiconductors**



PHILIPS