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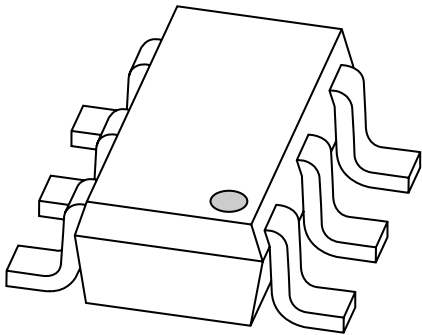
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# DATA SHEET



## **PMEM4020ND** NPN transistor/Schottky-diode module

Product data sheet

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

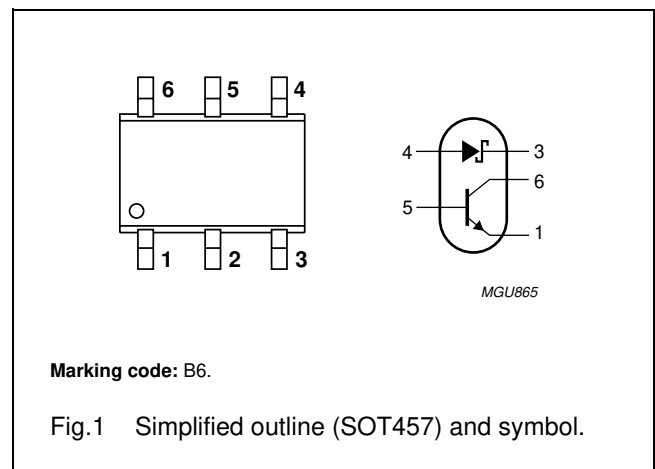
- DC-to-DC converters
- Inductive load drivers
- MOSFET drivers.

### 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.

### PINNING

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



### ORDERING INFORMATION

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

## NPN transistor/Schottky-diode module

## PMEM4020ND

**LIMITING VALUES**

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
<b>NPN transistor</b>					
V <sub>CBO</sub>	collector-base voltage	open emitter	–	40	V
V <sub>CEO</sub>	collector-emitter voltage	open base	–	40	V
V <sub>EBO</sub>	emitter-base voltage	open collector	–	5	V
I <sub>C</sub>	collector current (DC)	note 1	–	0.95	A
		note 2	–	1.30	A
		note 3	–	1.65	A
		T <sub>s</sub> ≤ 55 °C; note 4	–	2.0	A
I <sub>CM</sub>	peak collector current		–	3	A
I <sub>BM</sub>	peak base current		–	1	A
P <sub>tot</sub>	total power dissipation	T <sub>amb</sub> ≤ 25 °C; note 1	–	295	mW
		T <sub>amb</sub> ≤ 25 °C; note 2	–	400	mW
		T <sub>amb</sub> ≤ 25 °C; note 3	–	500	mW
		T <sub>s</sub> ≤ 55 °C; note 4	–	1000	mW
T <sub>j</sub>	junction temperature		–	150	°C
<b>Schottky barrier diode</b>					
V <sub>R</sub>	continuous reverse voltage		–	20	V
I <sub>F</sub>	continuous forward current		–	1	A
I <sub>FSM</sub>	non-repetitive peak forward current	t = 8.3 ms square wave	–	5	A
P <sub>tot</sub>	total power dissipation	T <sub>amb</sub> ≤ 25 °C; note 1	–	295	mW
		T <sub>amb</sub> ≤ 25 °C; note 2	–	400	mW
		T <sub>amb</sub> ≤ 25 °C; note 3	–	500	mW
		T <sub>s</sub> ≤ 55 °C; note 4	–	1000	mW
T <sub>j</sub>	junction temperature	note 2	–	150	°C
<b>Combined device</b>					
P <sub>tot</sub>	total power dissipation	T <sub>amb</sub> = 25 °C; note 2	–	600	mW
T <sub>stg</sub>	storage temperature		–65	+150	°C
T <sub>amb</sub>	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 cm<sup>2</sup>.
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

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**THERMAL CHARACTERISTICS**

SYMBOL	PARAMETER	CONDITIONS	VALUE	UNIT
<b>Single device</b>				
$R_{th\ j-s}$	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
<b>Combined device</b>				
$R_{th\ j-a}$	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 cm<sup>2</sup>/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 CHARACTERISTICS**T<sub>amb</sub> = 25 °C unless otherwise specified.

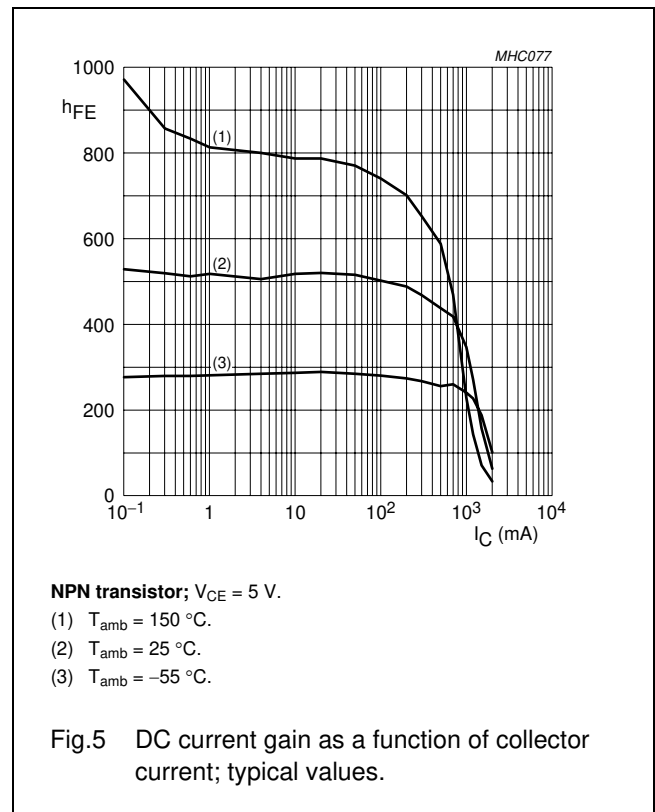
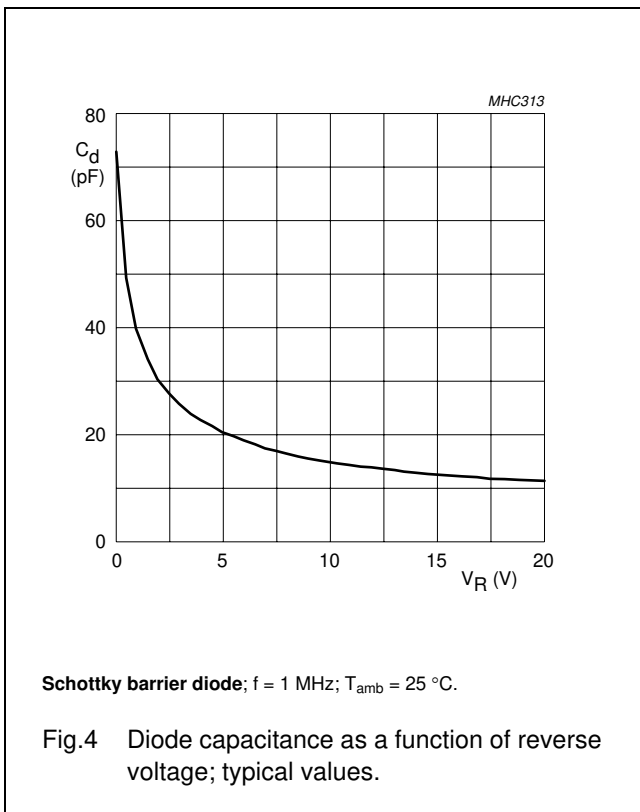
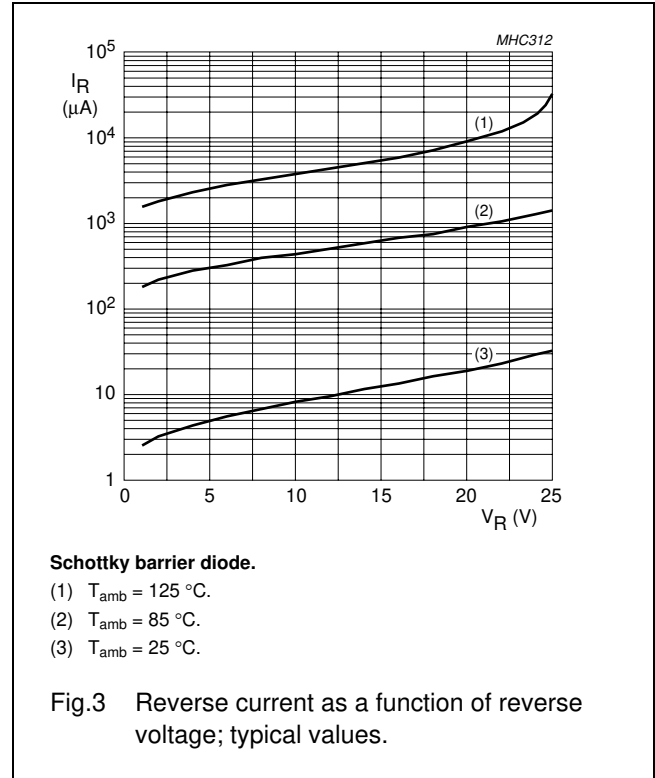
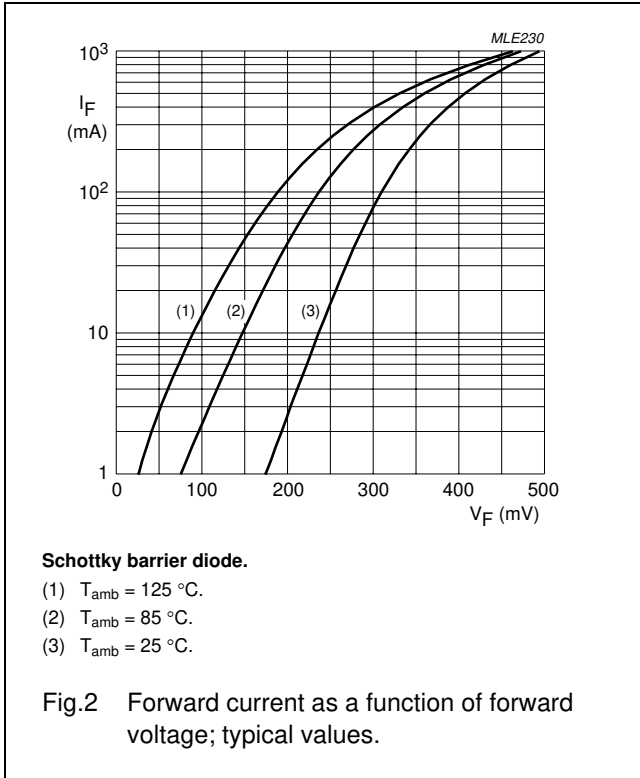
SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
<b>NPN transistor</b>						
I <sub>CBO</sub>	collector-base cut-off current	V <sub>CB</sub> = 40 V; I <sub>E</sub> = 0	–	–	100	nA
		V <sub>CB</sub> = 40 V; I <sub>E</sub> = 0; T <sub>amb</sub> = 150 °C	–	–	50	μA
I <sub>CEO</sub>	collector-emitter cut-off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

**Note**1. Pulse test: t<sub>p</sub> ≤ 300 μs; δ ≤ 0.02.

NPN transistor/Schottky-diode module

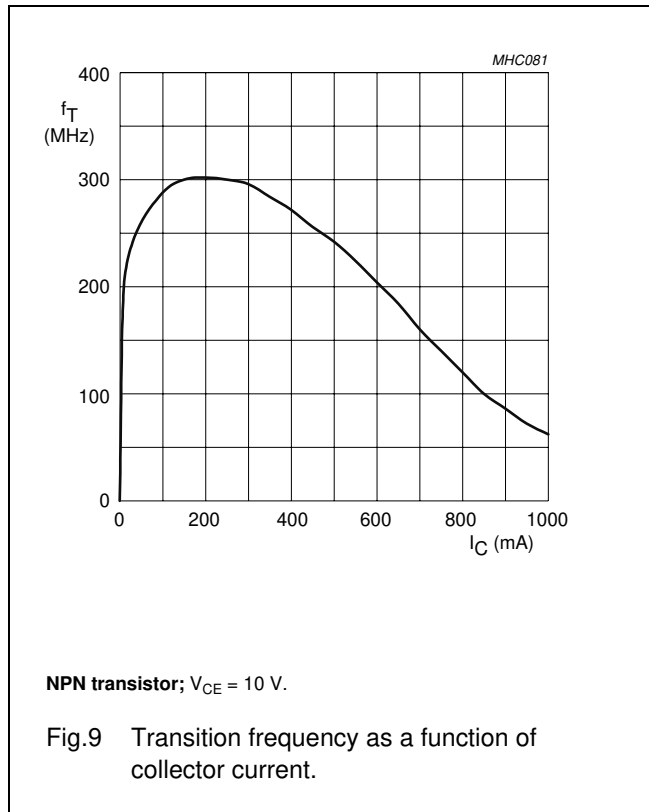
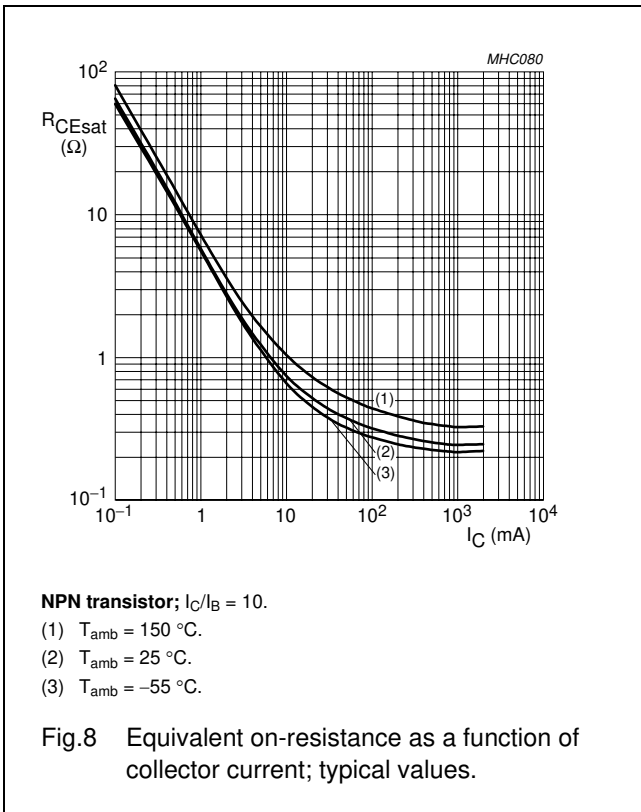
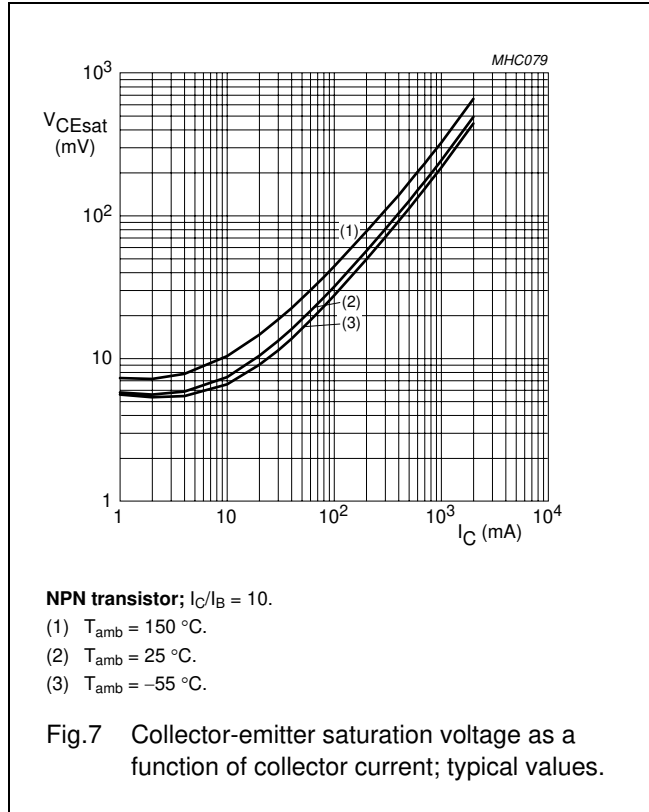
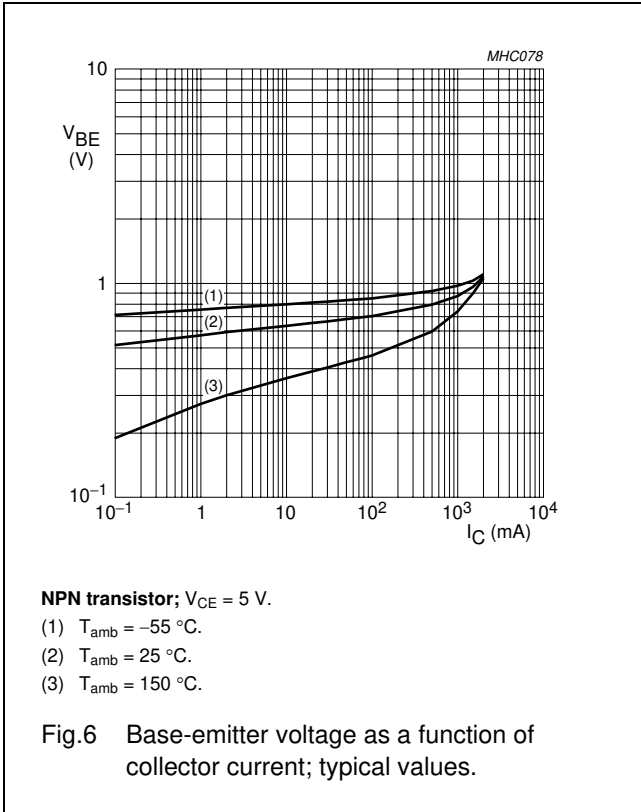
PMEM4020ND

GRAPHICAL DATA



NPN transistor/Schottky-diode module

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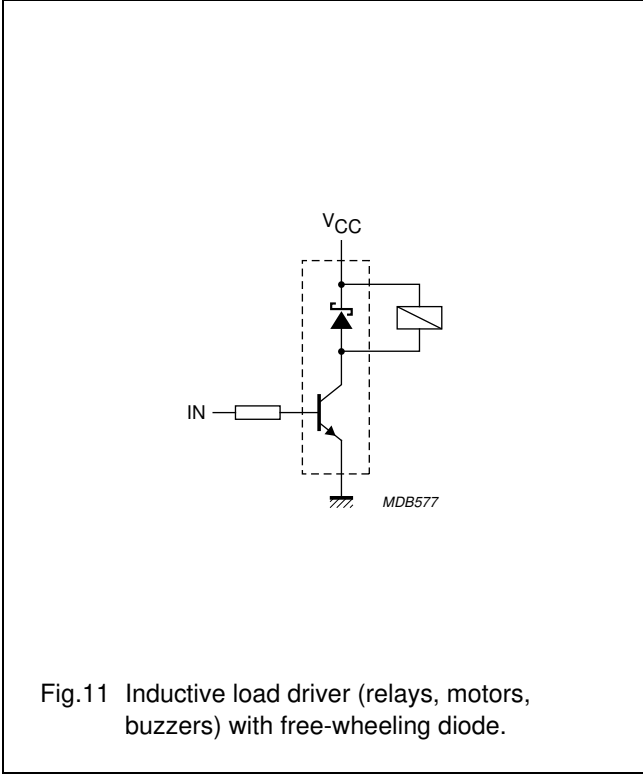
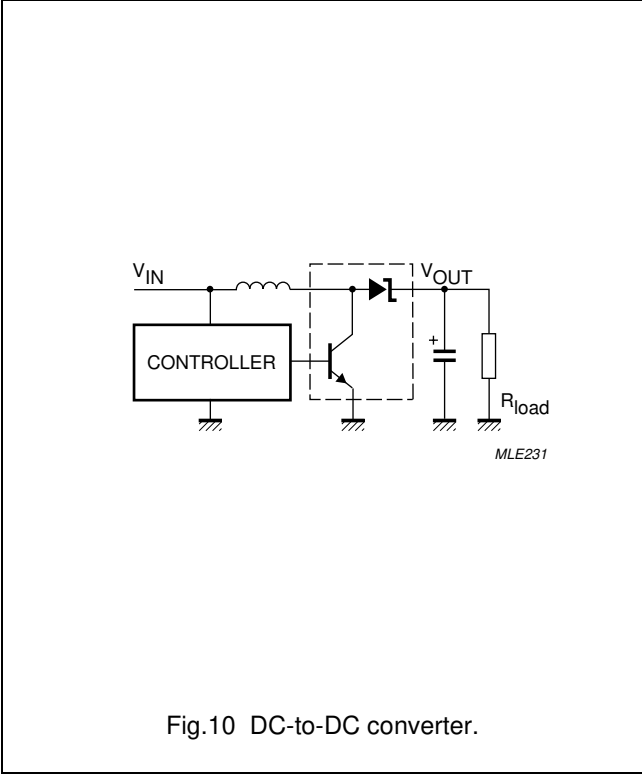




NPN transistor/Schottky-diode module

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APPLICATION INFORMATION



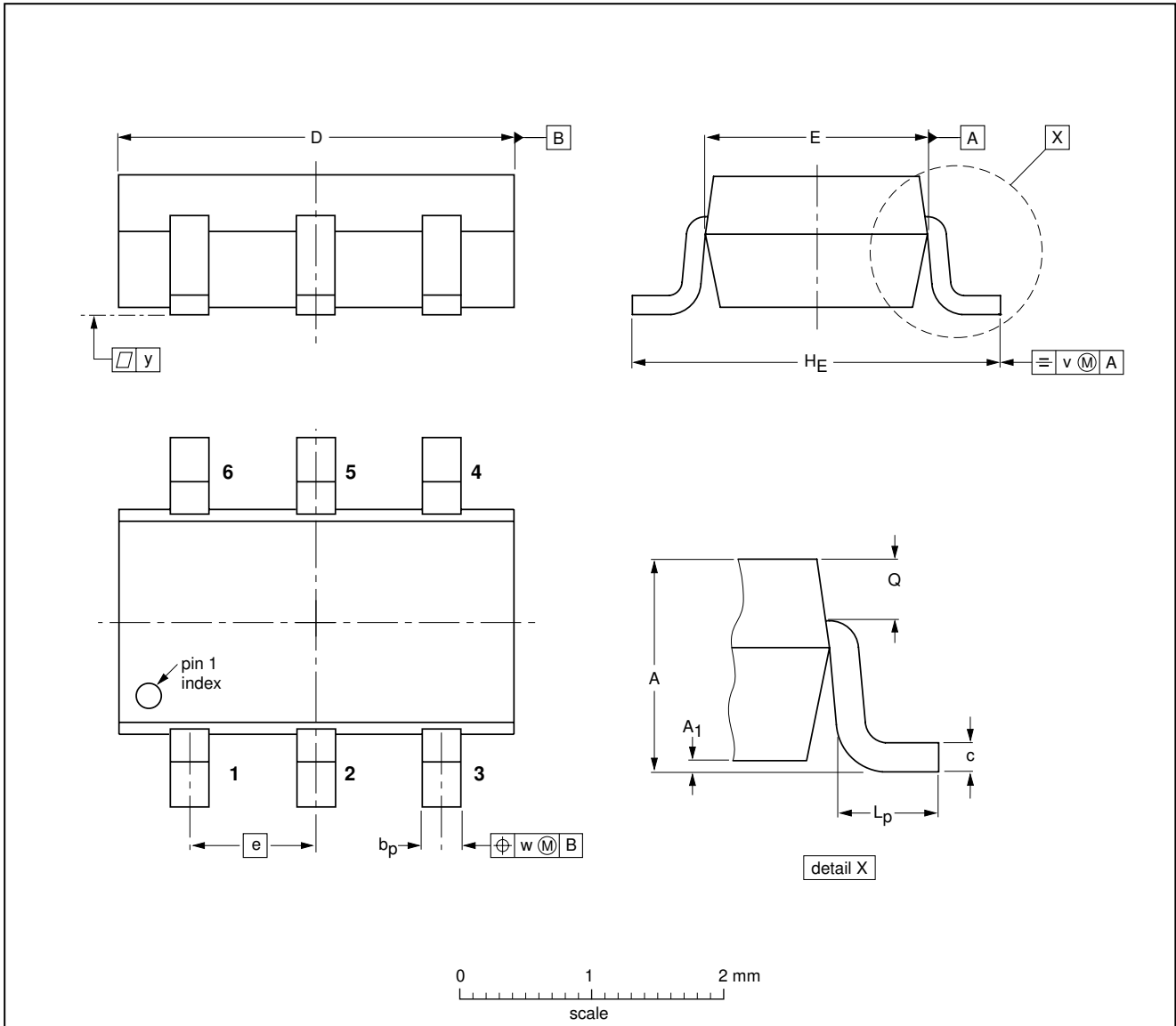
NPN transistor/Schottky-diode module

PMEM4020ND

PACKAGE OUTLINE

Plastic surface mounted package; 6 leads

SOT457



DIMENSIONS (mm are the original dimensions)

UNIT	A	A <sub>1</sub>	b <sub>p</sub>	c	D	E	e	H <sub>E</sub>	L <sub>p</sub>	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**

DOCUMENT STATUS <sup>(1)</sup>	PRODUCT STATUS <sup>(2)</sup>	DEFINITION
Objective data sheet	Development	This document contains data from the objective specification for product development.
Preliminary data sheet	Qualification	This document contains data from the preliminary specification.
Product data sheet	Production	This document contains the product specification.

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