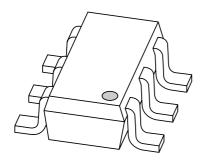
DISCRETE SEMICONDUCTORS

DATA SHEET



PMEM4020PD PNP transistor/Schottky-diode module

Product data sheet 2003 Nov 24



PNP transistor/Schottky-diode module

PMEM4020PD

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
- · General purpose load drivers
- Reverse polarity protection circuits.

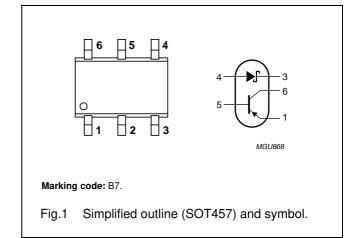
DESCRIPTION

Combination of a PNP 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.

NPN complement: PMEM4020ND.

PINNING

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



ORDERING INFORMATION

TYPE NUMBER		PACKAGE				
TIPE NOMBER	NAME	DESCRIPTION	VERSION			
PMEM4020PD	_	plastic surface mounted package; 6 leads	SOT457			

PNP transistor/Schottky-diode module

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LIMITING VALUES

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
PNP transis	stor		1	•	
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
Ic	collector current (DC)	note 1	_	-0.75	Α
		note 2	_	-1	Α
		note 3	_	-1.3	Α
		$T_s \le 55$ °C; note 4	_	-2	Α
I _{CM}	peak collector current		_	-3	Α
I _{BM}	peak base current		_	-1	Α
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
Tj	junction temperature		_	150	°C
Schottky b	arrier diode				
V _R	continuous reverse voltage		_	20	V
l _F	continuous forward current		_	1	Α
I _{FSM}	non-repetitive peak forward current	t = 8.3 ms half sinewave; JEDEC method	_	5	А
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. Mounted on a ceramic printed-circuit board; single-sided copper; tinplated; standard footprint.
- 4. Solder point of collector or cathode tab.

PNP transistor/Schottky-diode module

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THERMAL CHARACTERISTICS

SYMBOL	PARAMETER	METER CONDITIONS		
Single devic	e			
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	in free air; notes 1 and 3	250	K/W
	ambient	in free air; notes 1 and 4	315	K/W
		in free air; notes 1 and 5	425	K/W
Combined de	evice			
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 both 1 cm².
- 5. Device mounted on a FR4 printed-circuit board, single-sided copper; tinplated; standard footprint for SOT457.

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PNP transistor/Schottky-diode module

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ELECTRICAL CHARACTERISTICS

 T_{amb} = 25 °C unless otherwise specified.

SYMBOL	PARAMETER	MIN.	TYP.	MAX.	UNIT	
PNP transi	stor		•			
I _{CBO}	collector-base cut-off current	$V_{CB} = -40 \text{ V}; I_{E} = 0$	_	-	-100	nA
		$V_{CB} = -40 \text{ V}; I_E = 0; T_{amb} = 150 \text{ °C}$	_	-	-50	μА
I _{CEO}	collector-emitter cut-off current	$V_{CE} = -30 \text{ V}; I_B = 0$	_	-	-100	nA
I _{EBO}	emitter-base cut-off current	$V_{EB} = -5 \text{ V}; I_{C} = 0$	_	_	-100	nA
h _{FE}	current gain (DC)	$V_{CE} = -5 \text{ V}; I_{C} = -1 \text{ mA}$	300	_	_	
		$V_{CE} = -5 \text{ V}; I_{C} = -100 \text{ mA}$	300	_	800	
		$V_{CE} = -5 \text{ V}; I_{C} = -500 \text{ mA}$	250	_	_	
		$V_{CE} = -5 \text{ V}; I_{C} = -1 \text{ A}$	160	_	_	
		$V_{CE} = -5 \text{ V}; I_{C} = -2 \text{ A}; \text{ note 1}$	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
V _{BEsat}	base-emitter saturation voltage	-emitter saturation voltage $I_C = -1 \text{ A}$; $I_B = -50 \text{ mA}$				٧
R _{CEsat}	equivalent on-resistance	$I_C = -1 \text{ A}$; $I_B = -100 \text{ mA}$; note 1	_	180	280	mΩ
V_{BEon}	base-emitter turn-on voltage	$V_{CE} = -5 \text{ V}; I_{C} = -1 \text{ A}$	_	_	-1	V
f _T	transition frequency	$I_C = -50 \text{ mA}; V_{CE} = -10 \text{ V};$ f = 100 MHz	150	_	_	MHz
Schottky b	arrier 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 _F = 1000 mA	_	480	550	mV
I _R	reverse current	see Fig.3; note 1				
		V _R = 5 V	_	5	10	μА
		V _R = 8 V	_	7	20	μΑ
		V _R = 15 V	_	10	50	μΑ
C _d	diode capacitance	V _R = 5 V; f = 1 MHz; see Fig.4	_	19	25	pF

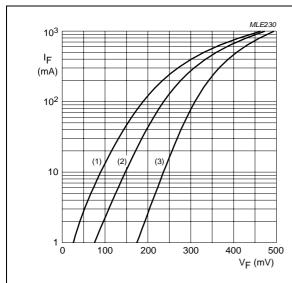
Note

1. Pulse test: $t_p \le 300~\mu s;~\delta \le 0.02.$

PNP transistor/Schottky-diode module

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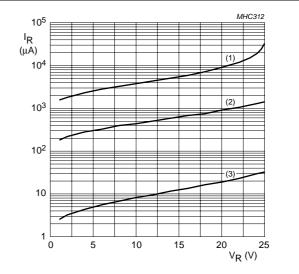
GRAPHICAL DATA



Schottky barrier diode.

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

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



Schottky barrier diode.

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

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

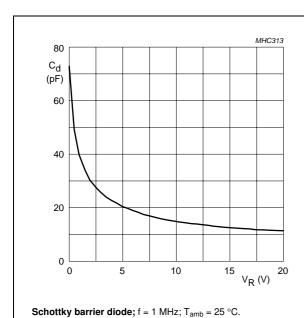
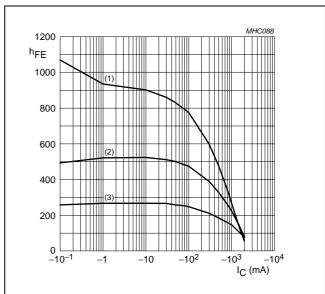


Fig.4 Diode capacitance as a function of reverse voltage; typical values.



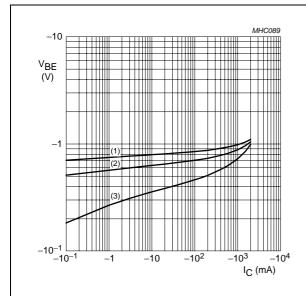
PNP transistor; $V_{CE} = -5 \text{ V}.$

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

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

PNP transistor/Schottky-diode module

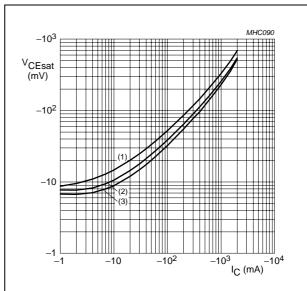
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PNP transistor; $V_{CE} = -5 \ V$.

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

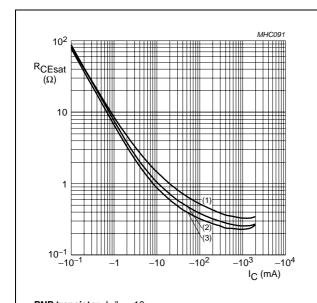
Fig.6 Base-emitter voltage as a function of collector current; typical values.



PNP transistor; $I_C/I_B = 10$.

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

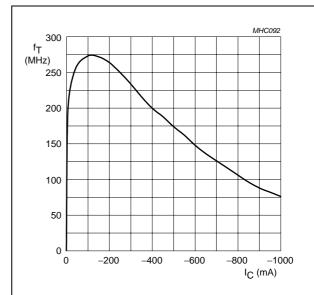
Fig.7 Collector-emitter saturation voltage as a function of collector current; typical values.



PNP transistor; $I_C/I_B = 10$.

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

Fig.8 Equivalent on-resistance as a function of collector current; typical values.



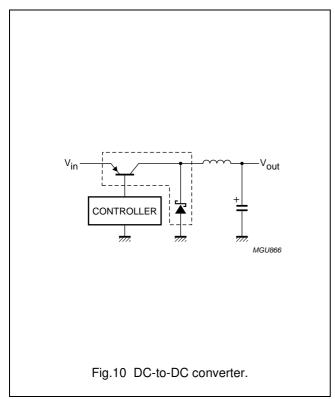
PNP transistor; $V_{CE} = -10 \ V$.

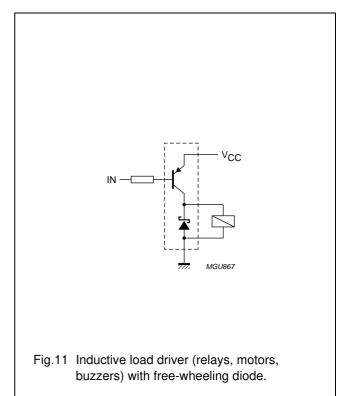
Fig.9 Transition frequency as a function of collector current.

PNP transistor/Schottky-diode module

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APPLICATION INFORMATION





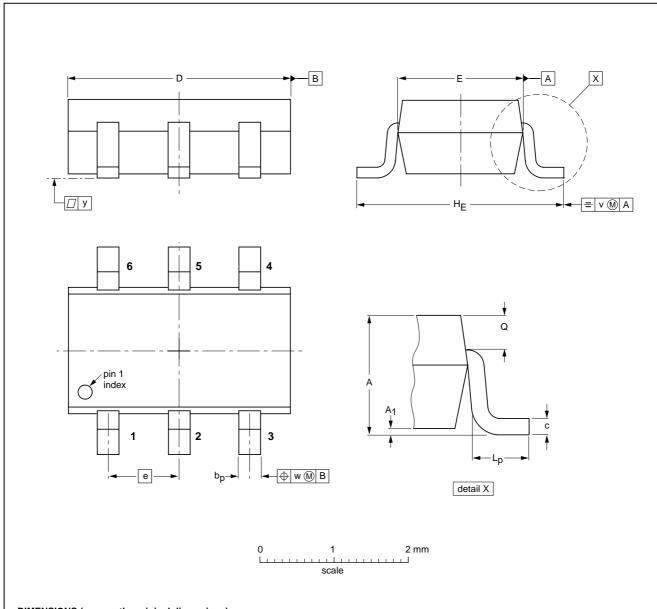
PNP transistor/Schottky-diode module

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PACKAGE OUTLINE

Plastic surface mounted package; 6 leads

SOT457



DIMENSIONS (mm are the original dimensions)

UNIT	A	A ₁	bp	С	D	E	е	HE	Lp	Q	v	w	у
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		REFERENCES			EUROPEAN ISSUE DAT		
VERSION	IEC	JEDEC	EIAJ		PROJECTION	ISSUE DATE	
SOT457			SC-74			97-02-28 01-05-04	

PNP transistor/Schottky-diode module

PMEM4020PD

DATA SHEET STATUS

DOCUMENT STATUS(1)	PRODUCT STATUS ⁽²⁾	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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Printed in The Netherlands R76/01/pp11 Date of release: 2003 Nov 24 Document order number: 9397 750 11907

