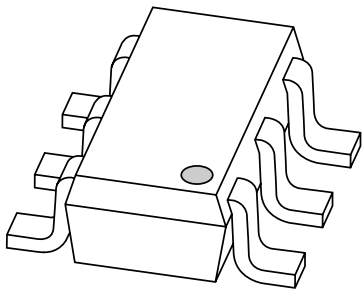


DATA SHEET



PMEM4020PD PNP transistor/Schottky-diode module

Product specification

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.

ORDERING INFORMATION

TYPE NUMBER	PACKAGE		
	NAME	DESCRIPTION	VERSION
PMEM4020PD	–	plastic surface mounted package; 6 leads	SOT457

PINNING

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

The figure shows two representations of the PMEM4020PD module. On the left is a simplified outline of the SOT457 package, a rectangular plastic package with six leads. The leads are numbered 1 through 6: 1 and 2 are on the left side, 3 and 4 are on the right side, and 5 and 6 are on the top side. On the right is the electrical symbol for the module, which combines a PNP transistor symbol and a Schottky diode symbol. The transistor's emitter is connected to lead 1, its base to lead 5, and its collector to lead 6. The Schottky diode's anode is connected to lead 4 and its cathode to lead 3. The symbol is labeled 'MGU868'.

Marking code: B7.

Fig.1 Simplified outline (SOT457) and symbol.

PNP transistor/Schottky-diode module

PMEM4020PD

LIMITING VALUES

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
PNP 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	–	–0.75	A
		note 2	–	–1	A
		note 3	–	–1.3	A
		$T_s \leq 55\text{ °C}$; note 4	–	–2	A
I_{CM}	peak collector current		–	–3	A
I_{BM}	peak base current		–	–1	A
P_{tot}	total power dissipation	$T_{amb} \leq 25\text{ °C}$; note 1	–	295	mW
		$T_{amb} \leq 25\text{ °C}$; note 2	–	400	mW
		$T_{amb} \leq 25\text{ °C}$; note 3	–	500	mW
		$T_s \leq 55\text{ °C}$; 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	$t = 8.3\text{ ms}$ half sinewave; JEDEC method	–	5	A
P_{tot}	total power dissipation	$T_{amb} \leq 25\text{ °C}$; note 1	–	295	mW
		$T_{amb} \leq 25\text{ °C}$; note 2	–	400	mW
		$T_{amb} \leq 25\text{ °C}$; note 3	–	500	mW
		$T_s \leq 55\text{ °C}$; note 4	–	1000	mW
T_j	junction temperature	note 2	–	150	°C
Combined device					
P_{tot}	total power dissipation	$T_{amb} = 25\text{ °C}$; 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 cm^2 .
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

PMEM4020PD

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 both 1 cm².
5. Device mounted on a FR4 printed-circuit board, single-sided copper; tinplated; standard footprint for SOT457.

PNP transistor/Schottky-diode module

PMEM4020PD

ELECTRICAL CHARACTERISTICS

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
PNP transistor						
I_{CBO}	collector-base cut-off current	$V_{CB} = -40\text{ V}; I_E = 0$	–	–	–100	nA
		$V_{CB} = -40\text{ V}; I_E = 0; T_{amb} = 150\text{ }^{\circ}\text{C}$	–	–	–50	μA
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	$I_C = -1\text{ A}; I_B = -50\text{ mA}$	–	–	–1.1	V
R_{CEsat}	equivalent on-resistance	$I_C = -1\text{ A}; I_B = -100\text{ mA}; \text{note 1}$	–	180	280	m Ω
V_{BEon}	base-emitter turn-on voltage	$V_{CE} = -5\text{ V}; I_C = -1\text{ A}$	–	–	–1	V
f_T	transition frequency	$I_C = -50\text{ mA}; V_{CE} = -10\text{ V};$ $f = 100\text{ MHz}$	150	–	–	MHz
Schottky barrier diode						
V_F	continuous forward voltage	see Fig.2; note 1				
		$I_F = 10\text{ mA}$	–	240	270	mV
		$I_F = 100\text{ mA}$	–	300	350	mV
		$I_F = 1000\text{ mA}$	–	480	550	mV
I_R	reverse current	see Fig.3; note 1				
		$V_R = 5\text{ V}$	–	5	10	μA
		$V_R = 8\text{ V}$	–	7	20	μA
		$V_R = 15\text{ V}$	–	10	50	μA
C_d	diode capacitance	$V_R = 5\text{ V}; f = 1\text{ MHz}; \text{see Fig.4}$	–	19	25	pF

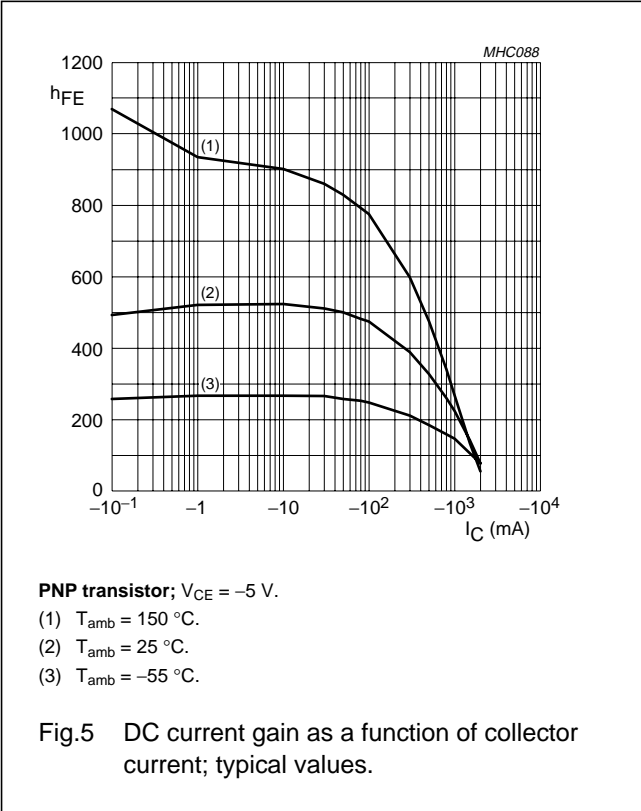
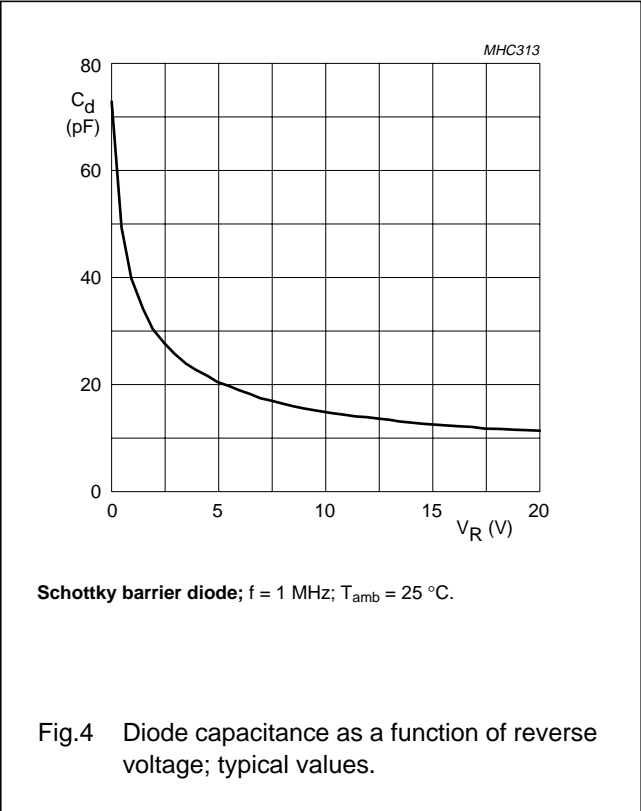
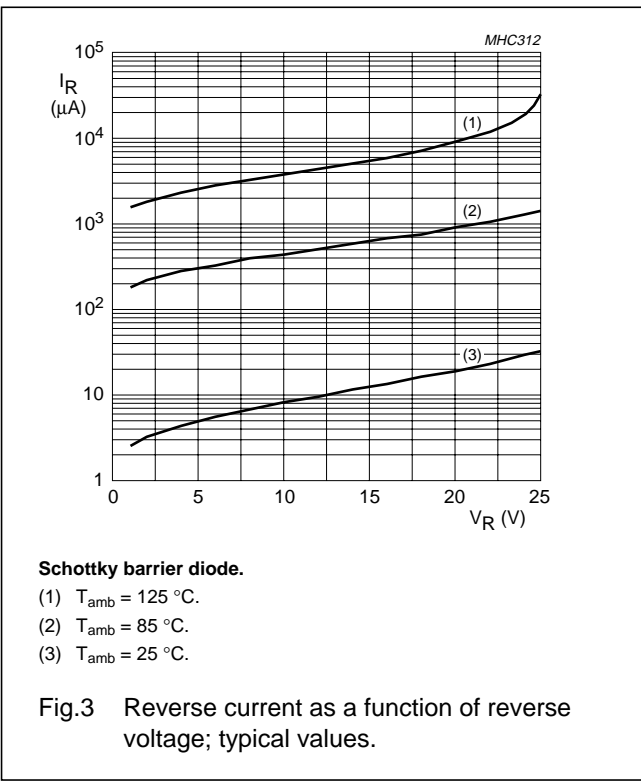
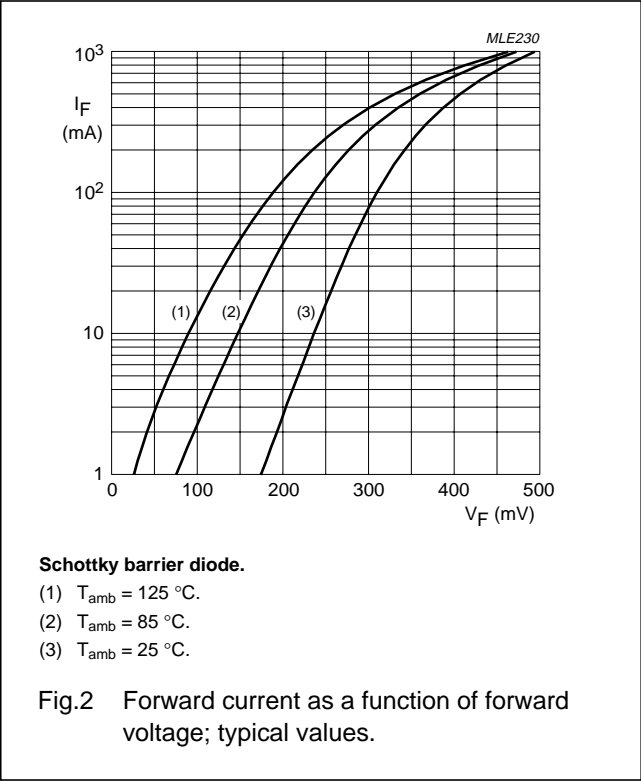
Note

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

PNP transistor/Schottky-diode module

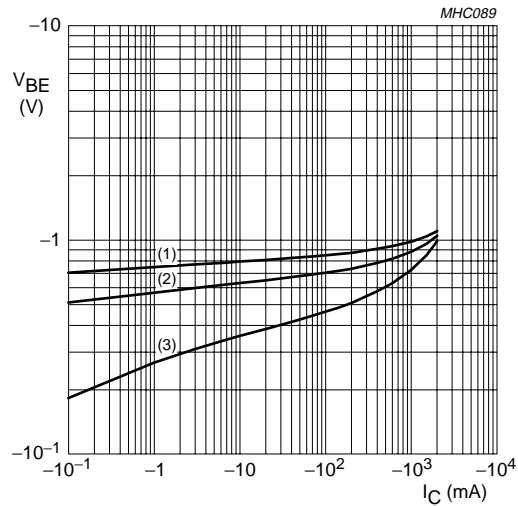
PMEM4020PD

GRAPHICAL DATA



PNP transistor/Schottky-diode module

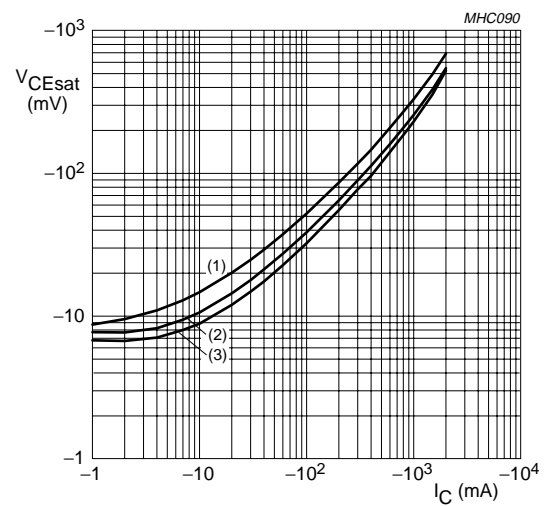
PMEM4020PD



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

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

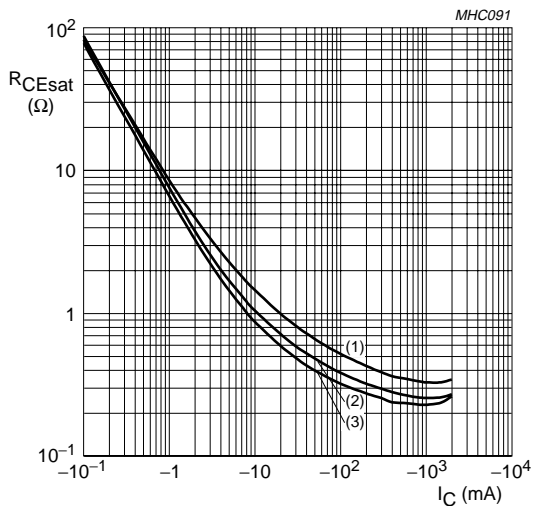
Fig.6 Base-emitter voltage as a function of collector current; typical values.



PNP transistor; $I_C/I_B = 10$.

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

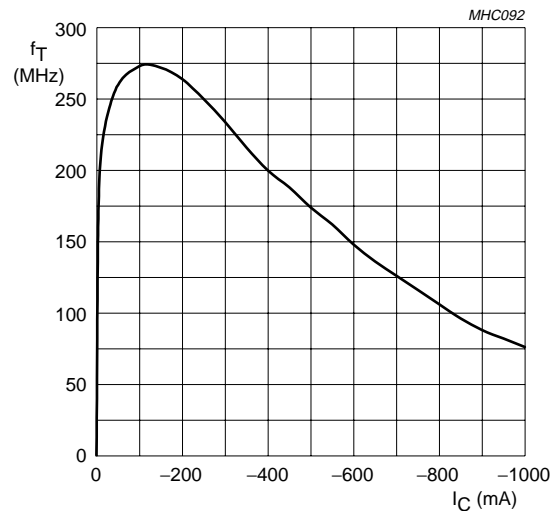
Fig.7 Collector-emitter saturation voltage as a function of collector current; typical values.



PNP transistor; $I_C/I_B = 10$.

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

PMEM4020PD

APPLICATION INFORMATION

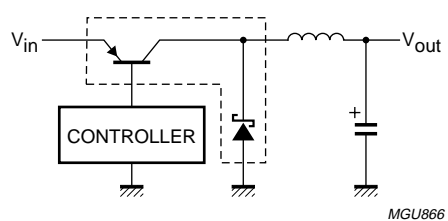


Fig.10 DC-to-DC converter.

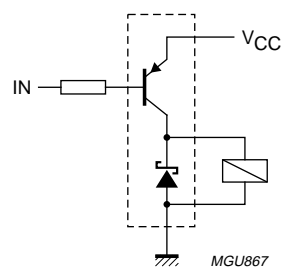


Fig.11 Inductive load driver (relays, motors, buzzers) with free-wheeling diode.

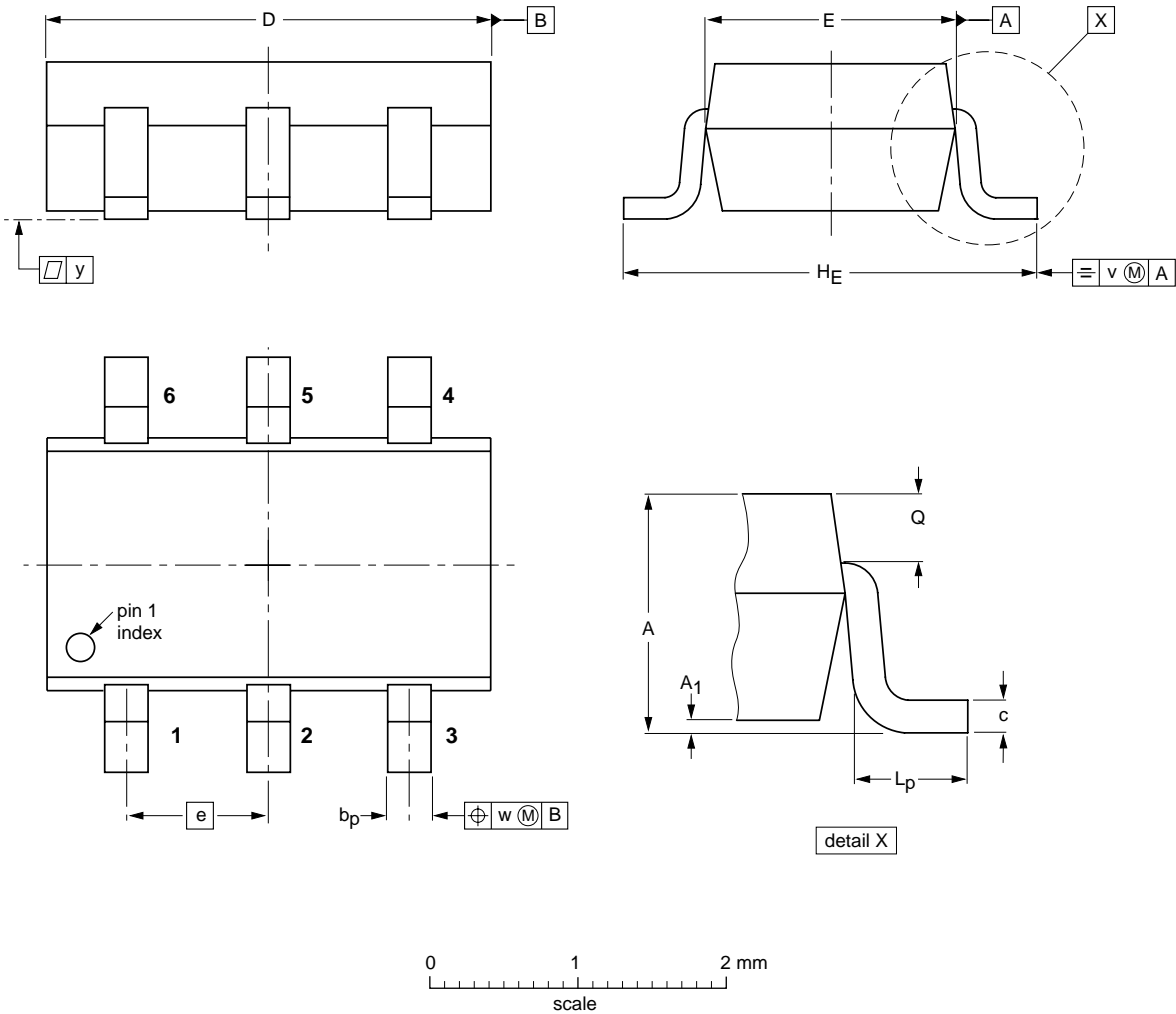
PNP transistor/Schottky-diode module

PMEM4020PD

PACKAGE OUTLINE

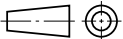
Plastic surface mounted package; 6 leads

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

PNP transistor/Schottky-diode module

PMEM4020PD

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Printed in The Netherlands

R76/01/pp11

Date of release: 2003 Nov 24

Document order number: 9397 750 11907

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