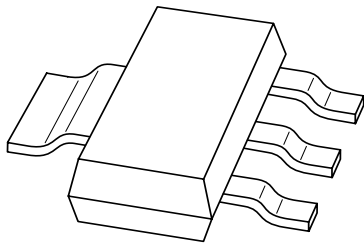


DATA SHEET



PZTM1101

NPN transistor/Schottky-diode
module

Product specification

1996 May 09

NPN transistor/Schottky-diode module

PZTM1101

FEATURES

- Low output capacitance
- Fast switching time
- Integrated Schottky protection diode.

APPLICATIONS

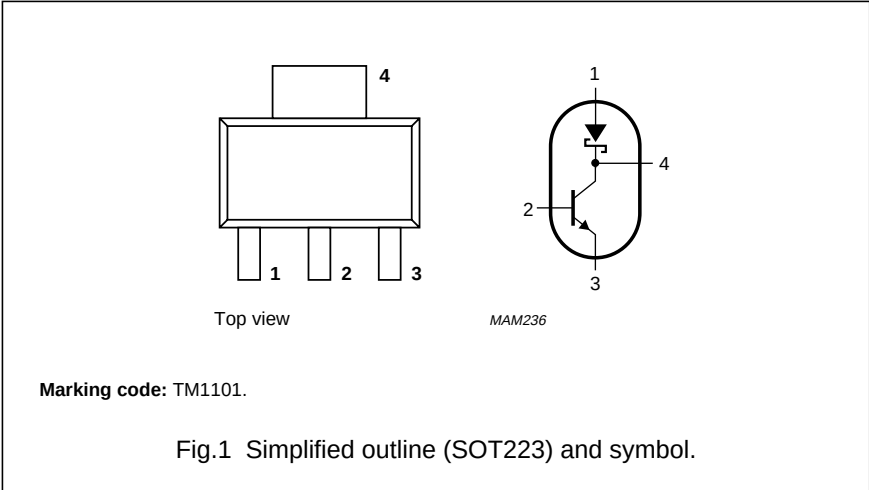
- High-speed switching for industrial applications.

PINNING

PIN	DESCRIPTION
1	anode Schottky
2	base
3	emitter
4	collector, cathode Schottky

DESCRIPTION

Combination of an NPN transistor and a Schottky barrier diode in a plastic SOT223 package. PNP complement: PZTM1102.



LIMITING VALUES

In accordance with the Absolute Maximum Rating System (IEC 134).

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
NPN transistor					
V _{CBO}	collector-base voltage	open emitter	–	60	V
V _{CES}	collector-emitter voltage	V _{BE} = 0	–	40	V
V _{EBO}	emitter-base voltage	open collector	–	6	V
I _C	collector current (DC)		–	200	mA
Schottky barrier diode					
V _R	continuous reverse voltage		–	40	V
I _F	forward current (DC)		–	1	A
I _{F(AV)}	average forward current		–	1	A
T _j	junction temperature	reverse current applied	–	125	°C
		forward current applied	–	150	°C
Combined device					
P _{tot}	total power dissipation	up to T _{amb} = 25 °C	–	1.2	W
T _{amb}	operating ambient temperature		–55	+150	°C
T _{stg}	storage temperature		–55	+150	°C
T _j	junction temperature		–	150	°C

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PZTM1101

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
NPN transistor					
V _{(BR)CBO}	collector-base breakdown voltage	open emitter; I _C = 10 μA; I _E = 0; T _{amb} = −55 to +150 °C; note 1	60	–	V
V _{(BR)CES}	collector-emitter breakdown voltage	open base; I _C = 1 mA; V _{BE} = 0; T _{amb} = −55 to +150 °C; note 1	40	–	V
V _{(BR)EBO}	emitter-base breakdown voltage	open collector; I _E = 10 μA; I _C = 0; T _{amb} = −55 to +150 °C; note 1	6	–	V
I _{CES}	collector-emitter cut-off current	V _{CE} = 20 V; V _{BE} = 0	–	100	nA
		V _{CE} = 20 V; V _{BE} = 0; T _{amb} = −55 to +150 °C	–	50	μA
I _{EBO}	emitter-base cut-off current	V _{EB} = 6 V; I _C = 0	–	50	nA
		V _{EB} = 6 V; I _C = 0; T _{amb} = −55 to +150 °C	–	10	μA
V _{CEsat}	collector-emitter saturation voltage	note 1			
		I _C = 10 mA; I _B = 1 mA I _C = 50 mA; I _B = 3.2 mA	– –	200 300	mV mV
V _{CEsat}	collector-emitter saturation voltage	T _{amb} = −55 to +150 °C; note 1			
		I _C = 10 mA; I _B = 1 mA I _C = 50 mA; I _B = 3.2 mA	– –	250 350	mV mV
V _{BEsat}	base-emitter saturation voltage	note 1			
		I _C = 10 mA; I _B = 1 mA I _C = 50 mA; I _B = 5 mA	– –	850 950	mV mV
V _{BEsat}	base-emitter saturation voltage	T _{amb} = −55 to +150 °C; note 1			
		I _C = 10 mA; I _B = 1 mA I _C = 50 mA; I _B = 5 mA	– –	1000 1100	mV mV
C _{ob}	output capacitance	I _E = i _e = 0; V _{CB} = 5 V; f = 1 MHz	–	4	pF
C _{ib}	input capacitance	I _C = i _c = 0; V _{EB} = 0.5 V; f = 1 MHz	–	8	pF
f _T	transition frequency	I _C = 10 mA; V _{CE} = 20 V; f = 100 MHz	300	–	MHz
h _{FE}	DC current gain	V _{CE} = 1 V; note 1			
		I _C = 0.1 mA	40	–	
		I _C = 1 mA	70	–	
		I _C = 10 mA	100	300	
h _{FE}	DC current gain	I _C = 100 mA	30	–	
		V _{CE} = 1 V; T _{amb} = −55 to +150 °C; note 1			
		I _C = 10 mA	60	500	
		I _C = 100 mA	15	–	
SWITCHING TIMES (see Figs 2 and 3)					
t _d	delay time	V _{CC} = 5 V	1	5	ns
t _r	rise time	I _C = 50 mA	16	31	ns
t _s	storage time	V _i = 0 to 5 V	110	310	ns
t _f	fall time		70	100	ns

NPN transistor/Schottky-diode module

PZTM1101

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
Schottky barrier diode					
V_F	forward voltage	$I_F = 100 \text{ mA}$; note 1	–	330	mV
		$I_F = 100 \text{ mA}$; $T_{\text{amb}} = -55 \text{ to } +150 \text{ }^\circ\text{C}$; note 1	–	400	mV
		$I_F = 1 \text{ A}$; note 1	–	500	mV
		$I_F = 1 \text{ A}$; $T_{\text{amb}} = -55 \text{ to } +150 \text{ }^\circ\text{C}$; note 1	–	560	mV
I_R	reverse current	$V_R = 40 \text{ V}$; note 1	–	300	μA
		$V_R = 40 \text{ V}$; $T_j = 125 \text{ }^\circ\text{C}$; $T_{\text{amb}} = -55 \text{ to } +150 \text{ }^\circ\text{C}$; note 1	–	35 ⁽²⁾	mA
I_R	reverse current	$V_R = 10 \text{ V}$; note 1	–	40	μA
		$V_R = 10 \text{ V}$; $T_j = 125 \text{ }^\circ\text{C}$; $T_{\text{amb}} = -55 \text{ to } +150 \text{ }^\circ\text{C}$; note 1	–	15 ⁽²⁾	mA
C_j	junction capacitance	$V_R = 0 \text{ V}$; $f = 1 \text{ MHz}$	–	250	pF

Notes

1. Measured under pulsed conditions: $t_p \leq 300 \mu\text{s}$; $\delta \leq 0.01$.
2. Limiting value for $T_j = 125 \text{ }^\circ\text{C}$; $T_j = 150 \text{ }^\circ\text{C}$ with reverse current applied is not allowed as this may cause thermal runaway leading to thermal destruction of the diode. A peak junction temperature of $T_j = 150 \text{ }^\circ\text{C}$ is only allowed with forward voltage applied.

THERMAL CHARACTERISTICS

SYMBOL	PARAMETER	CONDITIONS	VALUE	UNIT
$R_{\text{th j-a}}$	thermal resistance from junction to ambient (combined device)	note 1	100	K/W

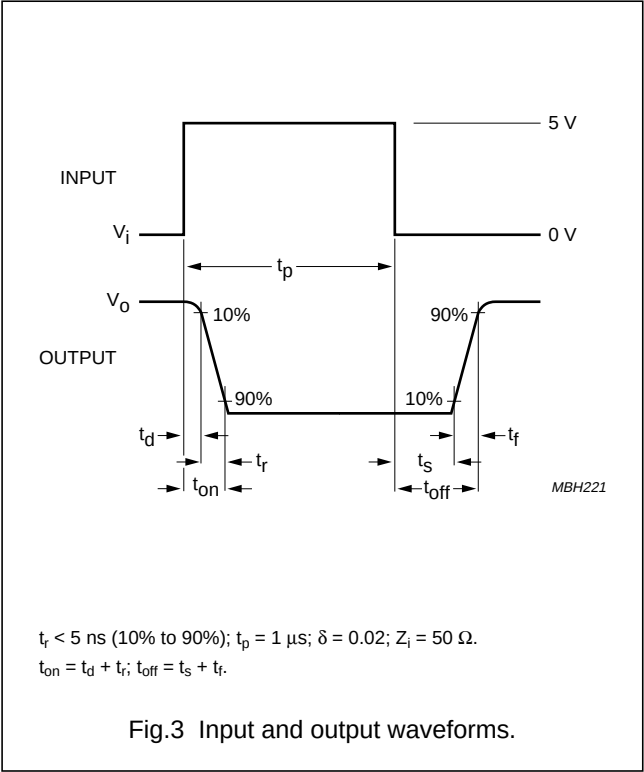
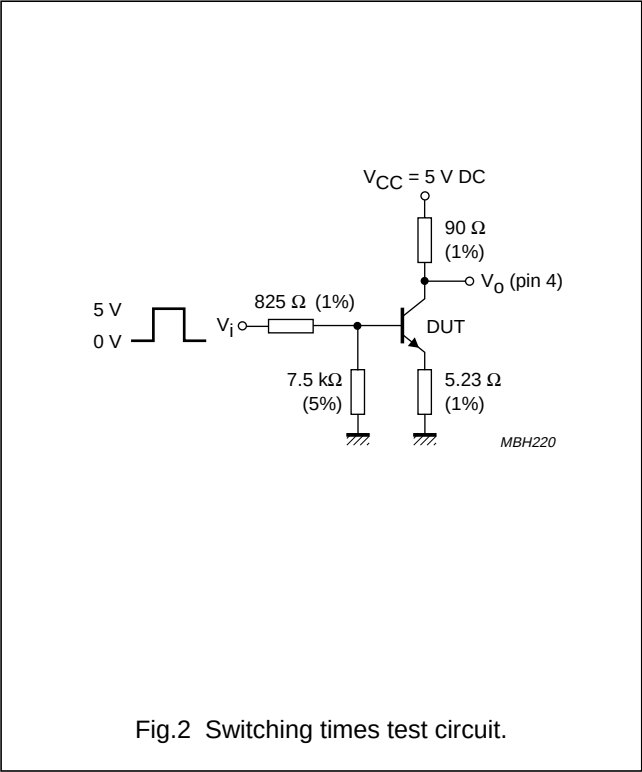
Note

1. Refer to SOT223 standard mounting conditions.

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PZTM1101

GRAPHICAL DATA



NPN transistor/Schottky-diode module

PZTM1101

PACKAGE OUTLINE

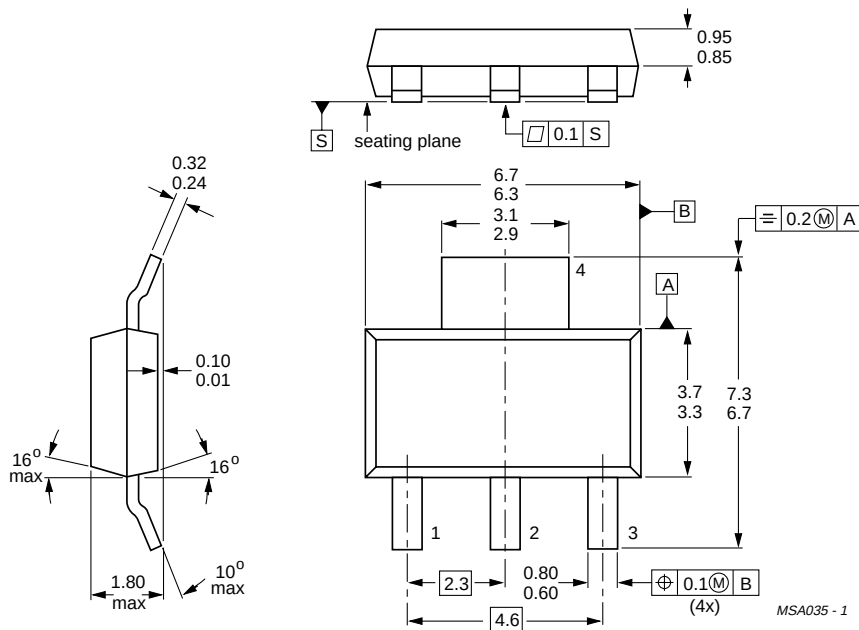


Fig.4 SOT223.

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DEFINITIONS

Data sheet status	
Objective specification	This data sheet contains target or goal specifications for product development.
Preliminary specification	This data sheet contains preliminary data; supplementary data may be published later.
Product specification	This data sheet contains final product specifications.
Limiting values	
Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 134). 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	
Where application information is given, it is advisory and does not form part of the specification.	

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 customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify Philips for any damages resulting from such improper use or sale.