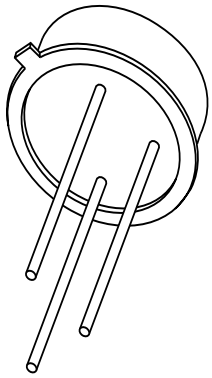
DATA SHEET



2N2369A
NPN switching transistor

Product specification
Supersedes data of September 1994
File under Discrete Semiconductors, SC04

1998 Mar 03

Philips
Semiconductors

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NPN switching transistor 2N2369A

FEATURES

- Low current (max. 200 mA)
- Low voltage (max.15 V).

APPLICATIONS

- High-speed saturated switching and high frequency amplifier applications.

DESCRIPTION

NPN switching transistor in a TO-18 metal package.

PINNING

PIN	DESCRIPTION
1	emitter
2	base
3	collector, connected to case

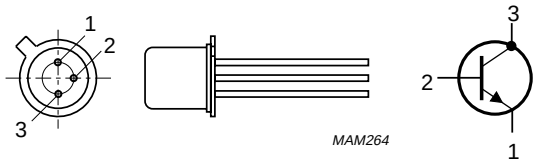


Fig.1 Simplified outline (TO-18) and symbol.

QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{CBO}	collector-base voltage	open emitter	–	40	V
V_{CEO}	collector-emitter voltage	open base	–	15	V
I_C	collector current (DC)		–	200	mA
P_{tot}	total power dissipation	$T_{amb} \leq 25$ °C	–	360	mW
h_{FE}	DC current gain	I_C = 10 mA; V_{CE} = 350 mV	40	–	
		I_C = 10 mA; V_{CE} = 1 V	–	120	
f_T	transition frequency	I_C = 10 mA; V_{CE} = 10 V; f = 100 MHz	500	–	MHz
t_{off}	turn-off time	I_{Con} = 10 mA; I_{Bon} = 3 mA; I_{Boff} = –1.5 mA	–	30	ns

LIMITING VALUES

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{CBO}	collector-base voltage	open emitter	–	40	V
V_{CEO}	collector-emitter voltage	open base	–	15	V
V_{EBO}	emitter-base voltage	open collector; I_C = 10 μA to 10 mA	–	4.5	V
I_C	collector current (DC)		–	200	mA
I_{CM}	peak collector current		–	300	mA
I_{BM}	peak base current		–	100	mA
P_{tot}	total power dissipation	$T_{amb} \leq 25$ °C	–	360	mW
		$T_{case} \leq 25$ °C	–	1.2	W
		$T_{case} \leq 100$ °C	–	680	mW
T_{stg}	storage temperature		–65	+150	°C
T_j	junction temperature		–	200	°C
T_{amb}	operating ambient temperature		–65	+150	°C

THERMAL CHARACTERISTICS

SYMBOL	PARAMETER	CONDITIONS	VALUE	UNIT
$R_{th\ j\text{-}a}$	thermal resistance from junction to ambient	in free air	486	K/W
$R_{th\ j\text{-}c}$	thermal resistance from junction to case		146	K/W

CHARACTERISTICS

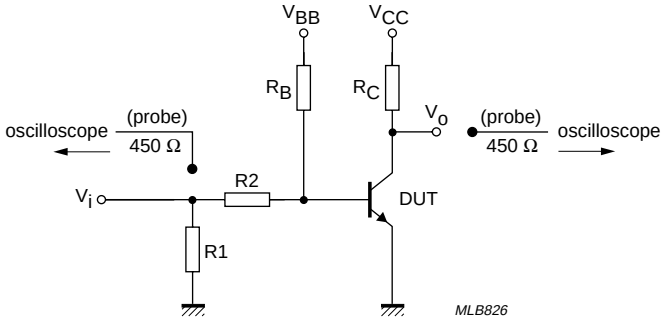
T_{amb} = 25 °C unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
I_{CBO}	collector cut-off current	I_E = 0; V_{CB} = 20 V	–	400	nA
		I_E = 0; V_{CB} = 20 V; T_{amb} = 150 °C	–	30	μA
I_{EBO}	emitter cut-off current	I_C = 0; V_{EB} = 4 V	–	100	nA
h_{FE}	DC current gain	I_C = 10 mA; V_{CE} = 350 mV; note 1	40	–	
		I_C = 10 mA; V_{CE} = 350 mV; T_{amb} = –55 °C; note 1	20	–	
		I_C = 10 mA; V_{CE} = 1 V; note 1	–	120	
		I_C = 30 mA; V_{CE} = 400 mV; note 1	30	–	
		I_C = 100 mA; V_{CE} = 1 V; note 1	20	–	
V_{CEsat}	collector-emitter saturation voltage	I_C = 10 mA; I_B = 1 mA	–	200	mV
		I_C = 10 mA; I_B = 1 mA; T_{amb} = 125 °C	–	300	mV
		I_C = 30 mA; I_B = 3 mA	–	250	mV
		I_C = 100 mA; I_B = 10 mA	–	500	mV

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{BEsat}	base-emitter saturation voltage	I_C = 10 mA; I_B = 1 mA	700	850	mV
		I_C = 10 mA; I_B = 1 mA; T_{amb} = 125 °C	590	–	mV
		I_C = 10 mA; I_B = 1 mA; T_{amb} = –55 °C	–	1.02	V
		I_C = 30 mA; I_B = 3 mA	–	1.15	V
		I_C = 100 mA; I_B = 10 mA	–	1.6	V
C_c	collector capacitance	$I_E = I_e$ = 0; V_{CB} = 5 V; f = 1 MHz	–	4	pF
f_T	transition frequency	I_C = 10 mA; V_{CE} = 10 V; f = 100 MHz	500	–	MHz
Switching times (between 10% and 90% levels); see Fig.2					
t_{on}	turn-on time	I_{Con} = 10 mA; I_{Bon} = 3 mA; I_{Boff} = –1.5 mA	–	10	ns
t_d	delay time		–	4	ns
t_r	rise time		–	6	ns
t_{off}	turn-off time		–	30	ns
t_s	storage time		–	15	ns
t_f	fall time		–	15	ns

Note

1. Pulse test: $t_p \leq 300$ μs; $\delta \leq 0.02$.

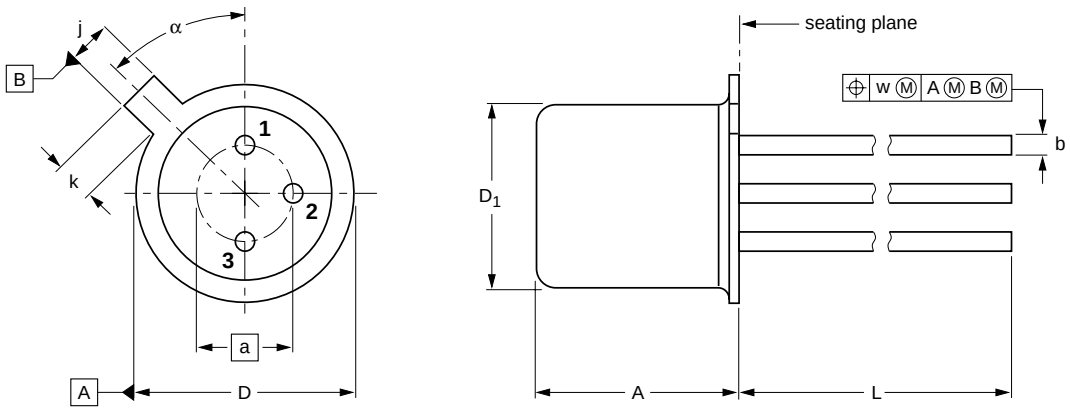


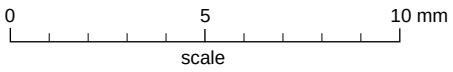
V_i = 0.5 V to 4.2 V; T = 500 μs; t_p = 10 μs; $t_r = t_f \leq 1$ ns.
R1 = 56 Ω; R2 = 1 kΩ; R_B = 1 kΩ; R_C = 270 Ω.
V_{BB} = 0.2 V; V_{CC} = 2.7 V.
Oscilloscope: input impedance Z_i = 50 Ω.

Fig.2 Test circuit for switching times.

PACKAGE OUTLINE

Metal-can cylindrical single-ended package; 3 leads **SOT18/13**





DIMENSIONS (millimetre dimensions are derived from the original inch dimensions)

UNIT	A	a	b	D	D_1	j	k	L	w	α
mm	5.31 4.74	2.54	0.47 0.41	5.45 5.30	4.70 4.55	1.03 0.94	1.1 0.9	15.0 12.7	0.40	45°

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT18/13	B11/C7 type 3	TO-18				97-04-18

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.

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