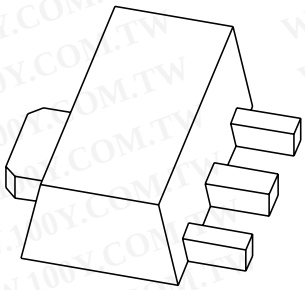
DATA SHEET



BST50; BST51; BST52
NPN Darlington transistors

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

1997 Apr 16

Philips Semiconductors

PHILIPS

NPN Darlington transistors BST50; BST51; BST52

FEATURES

- High current (max. 0.5 A)
- Low voltage (max. 80 V)
- Integrated diode and resistor.

APPLICATIONS

- Industrial switching applications such as:
  - print hammer
  - solenoid
  - relay and lamp driving.

DESCRIPTION

NPN Darlington transistor in a SOT89 plastic package.
PNP complements: BST60, BST61 and BST62.

MARKING

TYPE NUMBER	MARKING CODE
BST50	AS1
BST51	AS2
BST52	AS3

PINNING

PIN	DESCRIPTION
1	emitter
2	collector
3	base

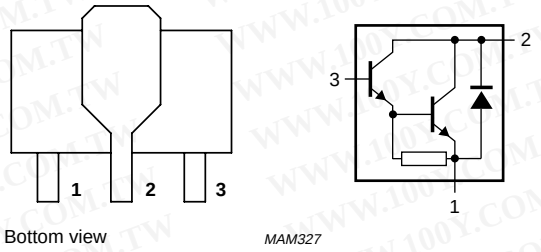


Fig.1 Simplified outline (SOT89) and symbol.

QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
V_{CBO}	collector-base voltage	open emitter				
	BST50		–	–	60	V
	BST51		–	–	80	V
	BST52		–	–	90	V
V_{CES}	collector-emitter voltage	V_{BE} = 0				
	BST50		–	–	45	V
	BST51		–	–	60	V
	BST52		–	–	80	V
I_C	collector current (DC)		–	–	0.5	A
P_{tot}	total power dissipation	$T_{amb} \leq 25$ °C	–	–	1.35	W
h_{FE}	DC current gain	I_C = 500 mA; V_{CE} = 10 V	2000	–	–	
f_T	transition frequency	I_C = 500 mA; V_{CE} = 5 V; f = 100 MHz	–	200	–	MHz

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			
	BST50		–	60	V
	BST51		–	80	V
	BST52		–	90	V
V_{CES}	collector-emitter voltage	V_{BE} = 0			
	BST50		–	45	V
	BST51		–	60	V
	BST52		–	80	V
V_{EBO}	emitter-base voltage	open collector	–	5	V
I_C	collector current (DC)		–	0.5	A
I_{CM}	peak collector current		–	1.5	A
I_B	base current (DC)		–	100	mA
P_{tot}	total power dissipation	$T_{amb} \leq 25$ °C; note 1	–	1.35	W
T_{stg}	storage temperature		–65	+150	°C
T_j	junction temperature		–	150	°C
T_{amb}	operating ambient temperature		–65	+150	°C

Note

1. Device mounted on a printed-circuit board, single sided copper, tinplated, mounting pad for collector 1 cm^2.
   For other mounting conditions, see *"Thermal considerations for the SOT89 in the General part of handbook SC04"*.

THERMAL CHARACTERISTICS

SYMBOL	PARAMETER	CONDITIONS	VALUE	UNIT
$R_{th\ j\text{-}a}$	thermal resistance from junction to ambient	note 1	92	K/W
$R_{th\ j\text{-}s}$	thermal resistance from junction to soldering point		11	K/W

Note

1. Device mounted on a printed-circuit board, single sided copper, tinplated, mounting pad for collector 1 cm^2.
   For other mounting conditions, see *"Thermal considerations for the SOT89 in the General part of handbook SC04"*.

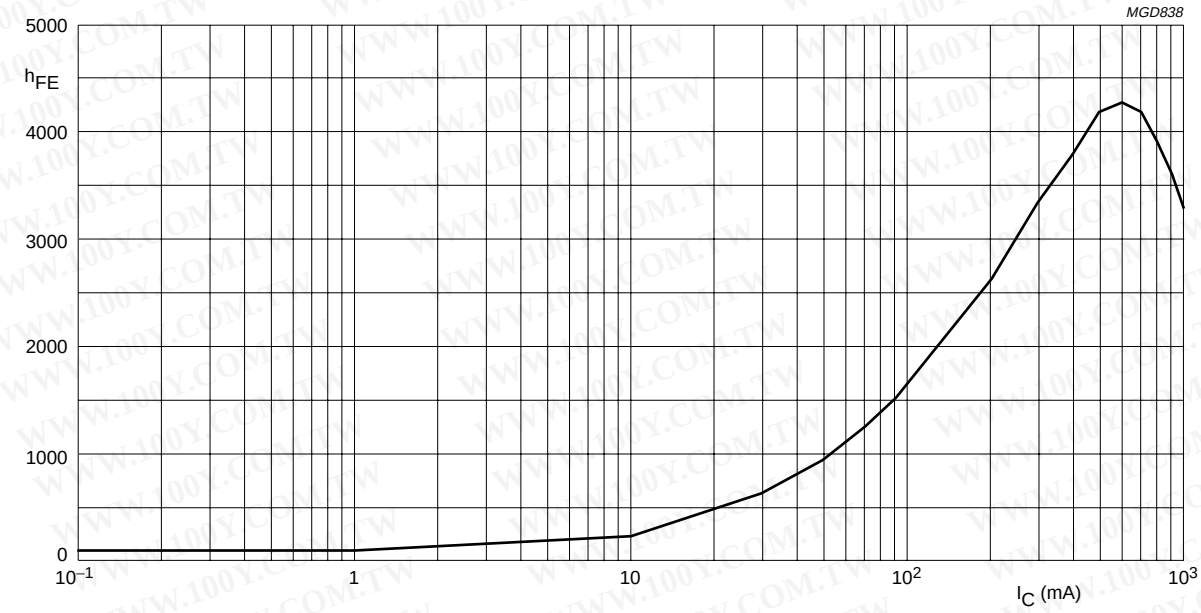
CHARACTERISTICS

T_j = 25 °C unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{CES}	collector cut-off current					
	BST50	V_{BE} = 0; V_{CE} = 45 V	–	–	50	nA
	BST51	V_{BE} = 0; V_{CE} = 60 V	–	–	50	nA
	BST52	V_{BE} = 0; V_{CE} = 80 V	–	–	50	nA
I_{EBO}	emitter cut-off current	I_C = 0; V_{EB} = 4 V	–	–	50	nA
h_{FE}	DC current gain	V_{CE} = 10 V; note 1; see Fig.2				
		I_C = 150 mA	1000	–	–	
		I_C = 500 mA	2000	–	–	
V_{CEsat}	collector-emitter saturation voltage	I_C = 500 mA; I_B = 0.5 mA	–	–	1.3	V
		I_C = 500 mA; I_B = 0.5 mA; T_j = 150 °C	–	–	1.3	V
V_{BEsat}	base-emitter saturation voltage	I_C = 500 mA; I_B = 0.5 mA	–	–	1.9	V
f_T	transition frequency	I_C = 500 mA; V_{CE} = 5 V; f = 100 MHz	–	200	–	MHz
Switching times (between 10% and 90% levels); see Fig.3						
t_{on}	turn-on time	I_{Con} = 500 mA; I_{Bon} = 0.5 mA; I_{Boff} = –0.5 mA	–	400	–	ns
t_{off}	turn-off time		–	1500	–	ns

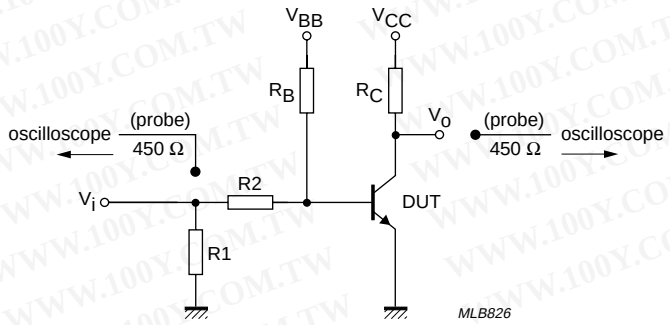
Note

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



V_{CE} = 10 V.

Fig.2 DC current gain; typical values.

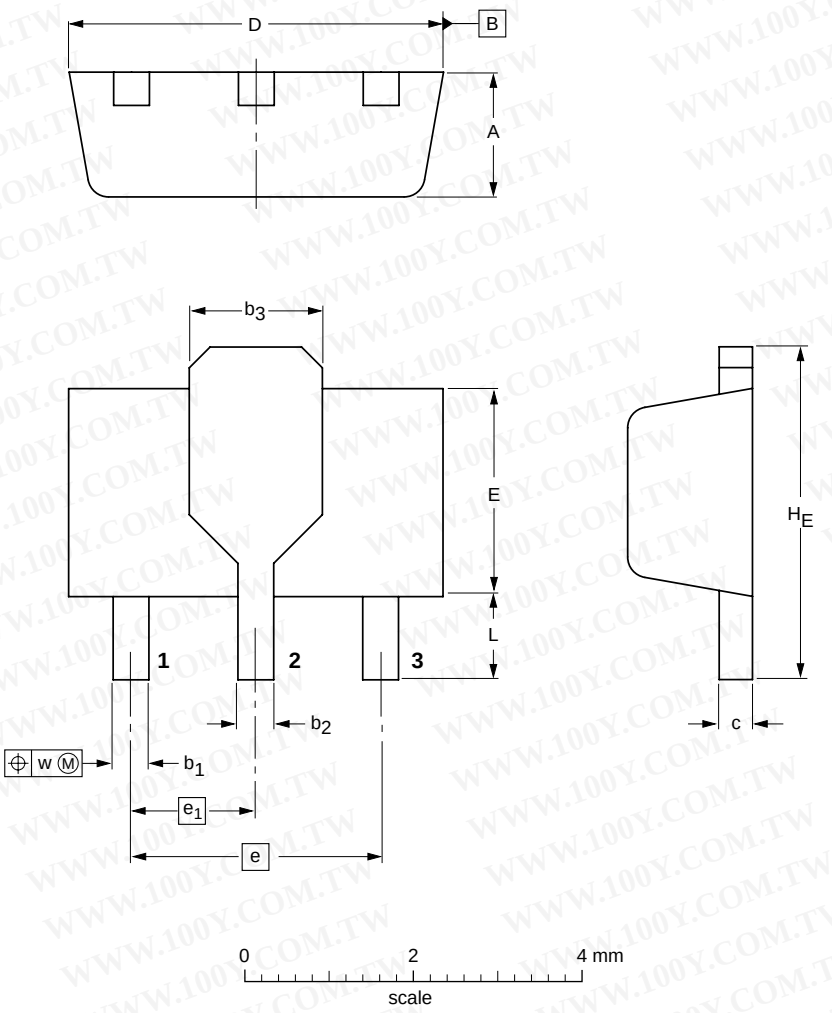


V_i = 10 V; T = 200 µs; t_p = 6 µs; $t_r = t_f \leq 3$ ns.
R1 = 56 Ω; R2 = 10 kΩ; R_B = 10 kΩ; R_C = 18 Ω.
V_{BB} = –1.8 V; V_{CC} = 10.7 V.
Oscilloscope: input impedance Z_i = 50 Ω.

Fig.3 Test circuit for switching times.

PACKAGE OUTLINE

Plastic surface mounted package; collector pad for good heat transfer; 3 leads **SOT89**



DIMENSIONS (mm are the original dimensions)

UNIT	A	b_1	b_2	b_3	c	D	E	e	e_1	H_E	L min.	w
mm	1.6 1.4	0.48 0.35	0.53 0.40	1.8 1.4	0.44 0.37	4.6 4.4	2.6 2.4	3.0	1.5	4.25 3.75	0.8	0.13

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT89						97-02-28

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.