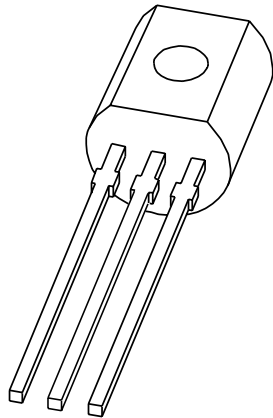


# DATA SHEET



## **BSR50; BSR51; BSR52** NPN Darlington transistors

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

1997 May 12

## NPN Darlington transistors

## BSR50; BSR51; BSR52

## FEATURES

- High current (max. 1 A)
- Low voltage (max. 80 V)
- Integrated diode and resistor.

## APPLICATIONS

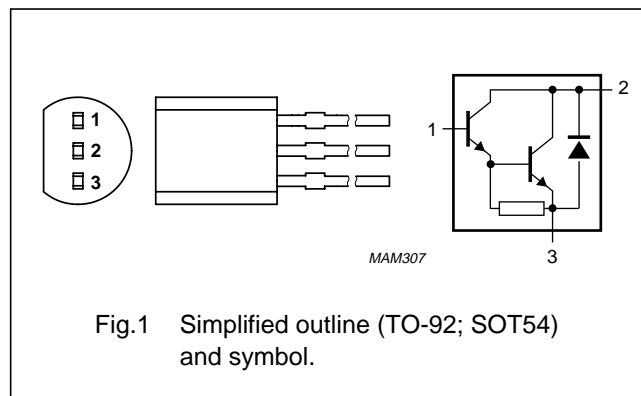
- Industrial high gain amplification.

## DESCRIPTION

NPN Darlington transistor in a TO-92; SOT54 plastic package. PNP complements: BSR60, BSR61 and BSR62.

## PINNING

PIN	DESCRIPTION
1	base
2	collector
3	emitter



## QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{CBO}$	collector-base voltage	open emitter				
	BSR50		–	–	60	V
	BSR51		–	–	80	V
$V_{CES}$	collector-emitter voltage	$V_{BE} = 0$				
	BSR50		–	–	45	V
	BSR51		–	–	60	V
$I_C$	collector current (DC)		–	–	1	A
$P_{tot}$	total power dissipation	$T_{amb} \leq 25\text{ }^\circ\text{C}$	–	–	0.83	W
$h_{FE}$	DC current gain	$I_C = 150\text{ mA}; V_{CE} = 10\text{ V}$	1000	–	–	
		$I_C = 500\text{ mA}; V_{CE} = 10\text{ V}$	2000	–	–	
$f_T$	transition frequency	$I_C = 500\text{ mA}; V_{CE} = 5\text{ V}; f = 100\text{ MHz}$	–	200	–	MHz

## NPN Darlington transistors

## BSR50; BSR51; BSR52

**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			
	BSR50		–	60	V
	BSR51		–	80	V
	BSR52	–	90	V	
$V_{CES}$	collector-emitter voltage	$V_{BE} = 0$			
	BSR50		–	45	V
	BSR51		–	60	V
	BSR52	–	80	V	
$V_{EBO}$	emitter-base voltage	open collector	–	5	V
$I_C$	collector current (DC)		–	1	A
$I_{CM}$	peak collector current		–	2	A
$I_B$	base current (DC)		–	100	mA
$P_{tot}$	total power dissipation	$T_{amb} \leq 25\text{ °C}$ ; note 1	–	0.83	W
$T_{stg}$	storage temperature		–65	+150	°C
$T_j$	junction temperature		–	150	°C
$T_{amb}$	operating ambient temperature		–65	+150	°C

**Note**

1. Transistor mounted on an FR4 printed-circuit board.

**THERMAL CHARACTERISTICS**

SYMBOL	PARAMETER	CONDITIONS	VALUE	UNIT
$R_{th\ j-a}$	thermal resistance from junction to ambient	note 1	150	K/W

**Note**

1. Transistor mounted on an FR4 printed-circuit board.

## NPN Darlington transistors

## BSR50; BSR51; BSR52

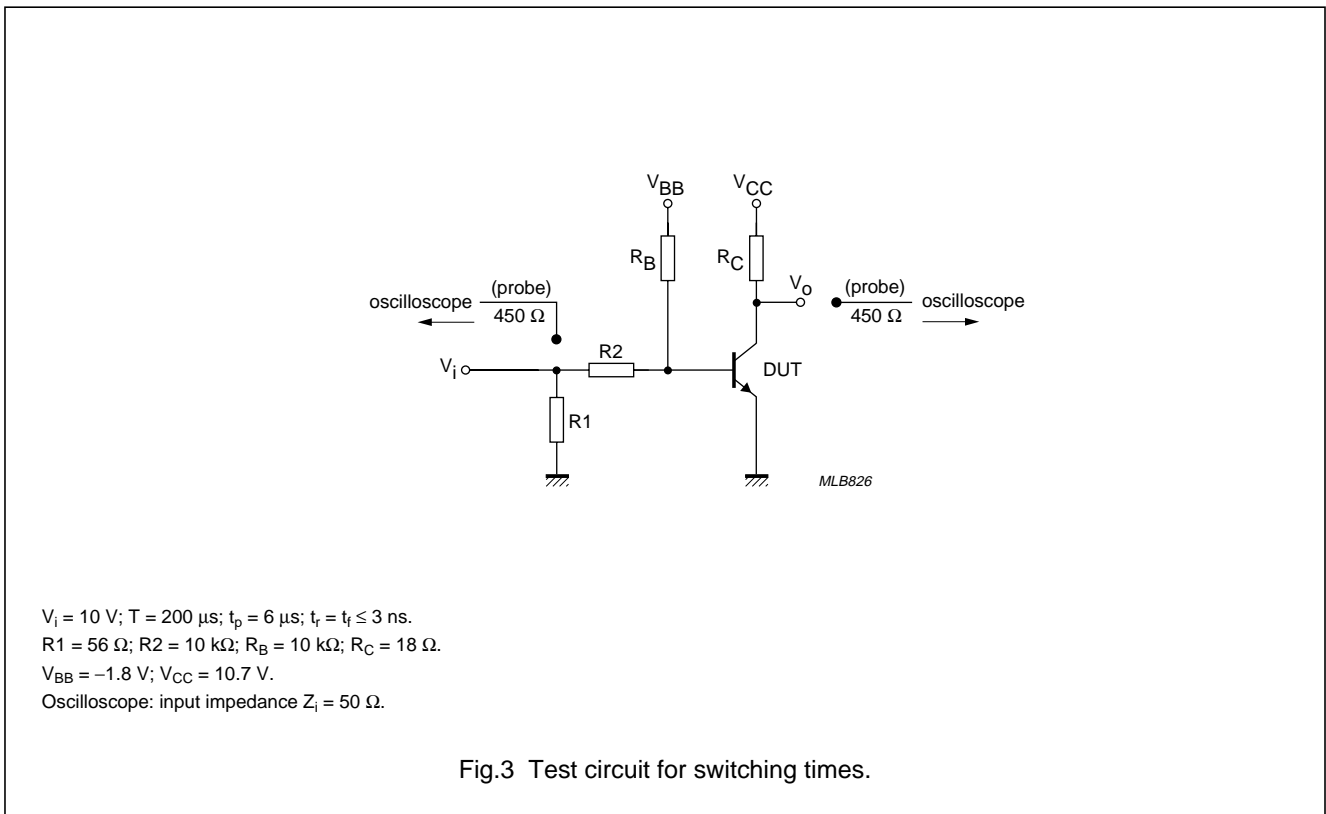
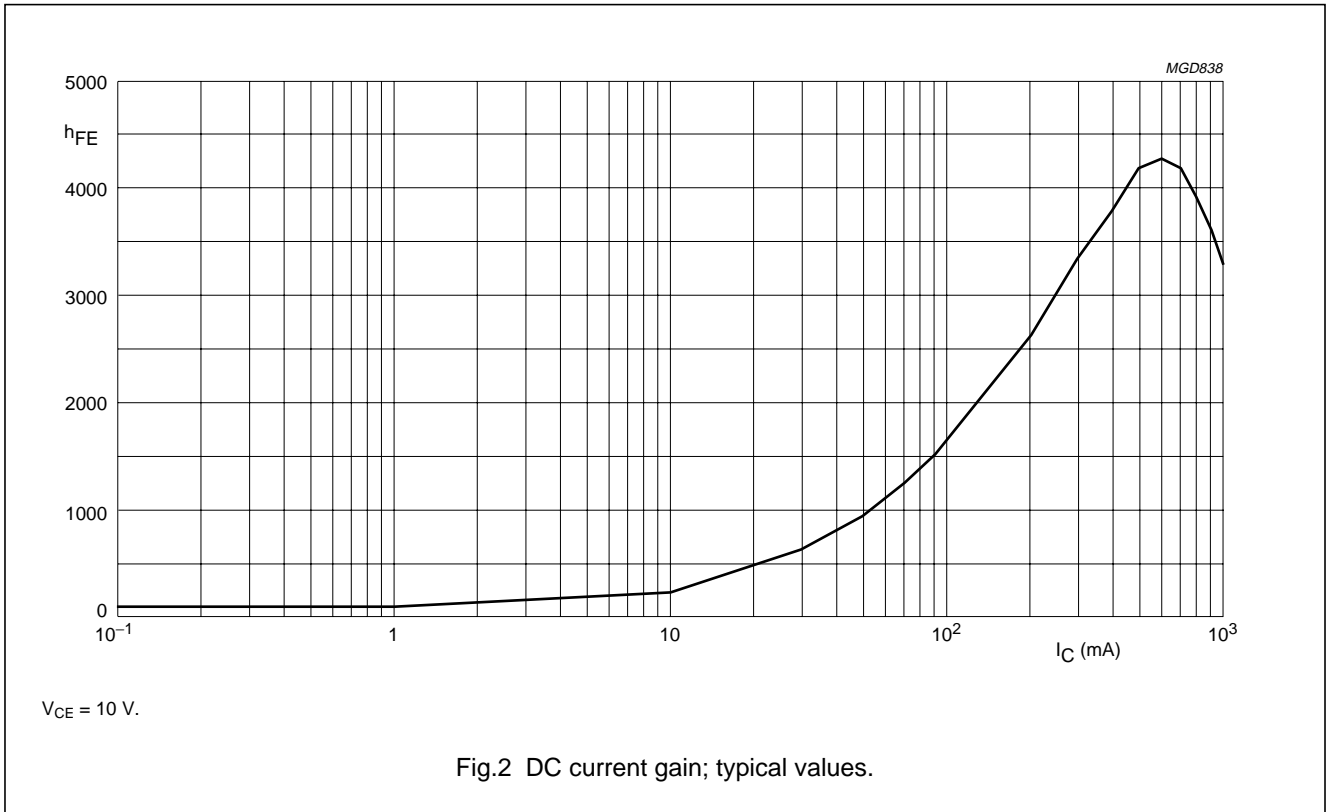
**CHARACTERISTICS**

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT	
$I_{CES}$	collector cut-off current						
	BSR50	$V_{BE} = 0; V_{CE} = 45\text{ V}$	–	–	50	nA	
	BSR51	$V_{BE} = 0; V_{CE} = 60\text{ V}$	–	–	50	nA	
	BSR52	$V_{BE} = 0; V_{CE} = 80\text{ V}$	–	–	50	nA	
$I_{EBO}$	emitter cut-off current	$I_C = 0; V_{EB} = 4\text{ V}$	–	–	50	nA	
$h_{FE}$	DC current gain	$V_{CE} = 10\text{ V}$ ; see Fig.2					
		$I_C = 150\text{ mA}$	1000	–	–		
		$I_C = 500\text{ mA}$	2000	–	–		
$V_{CEsat}$	collector-emitter saturation voltage	$I_C = 0.5\text{ A}; I_B = 0.5\text{ mA}$	–	–	1.3	V	
$V_{CEsat}$	collector-emitter saturation voltage	BSR51	$I_C = 1\text{ A}; I_B = 1\text{ mA}$	–	–	1.6	V
		BSR50; BSR52	$I_C = 1\text{ A}; I_B = 4\text{ mA}$	–	–	1.6	V
$V_{BEsat}$	base-emitter saturation voltage	$I_C = 0.5\text{ A}; I_B = 0.5\text{ mA}$	–	–	1.9	V	
$V_{BEsat}$	base-emitter saturation voltage	BSR51	$I_C = 1\text{ A}; I_B = 1\text{ mA}$	–	–	2.2	V
		BSR50; BSR52	$I_C = 1\text{ A}; I_B = 4\text{ mA}$	–	–	2.2	V
$f_T$	transition frequency	$I_C = 500\text{ mA}; V_{CE} = 5\text{ V}; f = 100\text{ MHz}$	–	200	–	MHz	
<b>Switching times (between 10% and 90% levels); see Fig.3</b>							
$t_{on}$	turn-on time	$I_{Con} = 500\text{ mA}; I_{Bon} = 0.5\text{ mA};$	–	–	500	ns	
$t_{off}$	turn-off time	$I_{Boff} = -0.5\text{ mA}$	–	–	1300	ns	

NPN Darlington transistors

BSR50; BSR51; BSR52



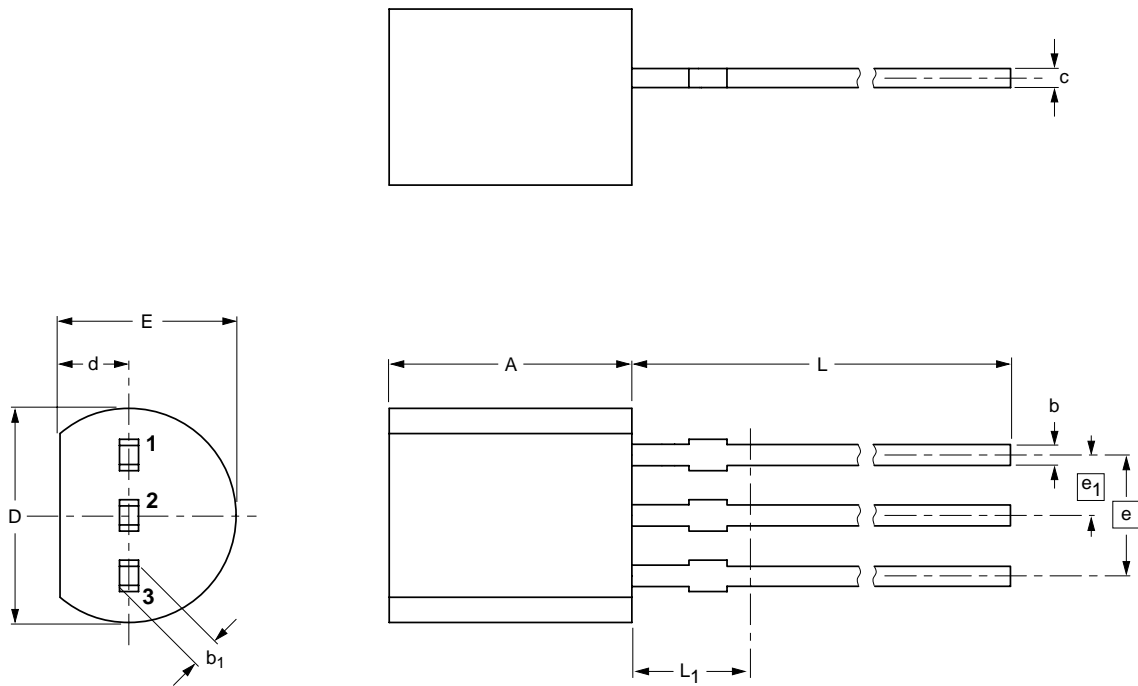
NPN Darlington transistors

BSR50; BSR51; BSR52

PACKAGE OUTLINE

Plastic single-ended leaded (through hole) package; 3 leads

SOT54




DIMENSIONS (mm are the original dimensions)

UNIT	A	b	b <sub>1</sub>	c	D	d	E	e	e <sub>1</sub>	L	L <sub>1</sub> <sup>(1)</sup>
mm	5.2	0.48	0.66	0.45	4.8	1.7	4.2	2.54	1.27	14.5	2.5
	5.0	0.40	0.56	0.40	4.4	1.4	3.6				

Note

1. Terminal dimensions within this zone are uncontrolled to allow for flow of plastic and terminal irregularities.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT54		TO-92	SC-43			97-02-28

## NPN Darlington transistors

BSR50; BSR51; BSR52

**DEFINITIONS**

<b>Data Sheet Status</b>	
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.
<b>Limiting values</b>	
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.	
<b>Application information</b>	
Where application information is given, it is advisory and does not form part of the specification.	

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