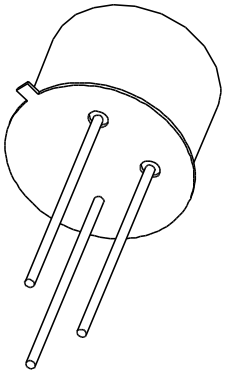
DATA SHEET



BFY50; BFY51; BFY52
NPN medium power transistors

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

1997 Apr 22

Philips
Semiconductors

PHILIPS

NPN medium power transistors BFY50; BFY51; BFY52

FEATURES

- High current (max. 1 A)
- Low voltage (max. 35 V).

APPLICATIONS

- General purpose industrial applications.

DESCRIPTION

NPN medium power transistor in a TO-39 metal package.

PINNING

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

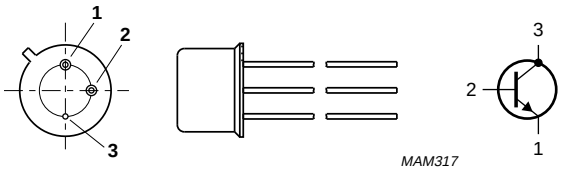


Fig.1 Simplified outline (TO-39) and symbol.

QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
V_{CBO}	collector-base voltage	open emitter				
	BFY50		–	–	80	V
	BFY51		–	–	60	V
	BFY52		–	–	40	V
V_{CEO}	collector-emitter voltage	open base				
	BFY50		–	–	35	V
	BFY51		–	–	30	V
	BFY52		–	–	20	V
I_{CM}	peak collector current		–	–	1	A
P_{tot}	total power dissipation	$T_{amb} \leq 25$ °C	–	–	800	mW
		$T_{case} \leq 100$ °C	–	–	2.86	W
h_{FE}	DC current gain	I_C = 150 mA; V_{CE} = 10 V				
	BFY50		30	112	–	
	BFY51		40	123	–	
	BFY52		60	142	–	
f_T	transition frequency	I_C = 50 mA; V_{CE} = 10 V; f = 100 MHz				
	BFY50		60	–	–	MHz
	BFY51; BFY52		50	–	–	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			
	BFY50		–	80	V
	BFY51		–	60	V
	BFY52		–	40	V
V_{CEO}	collector-emitter voltage	open base			
	BFY50		–	35	V
	BFY51		–	30	V
	BFY52		–	20	V
V_{EBO}	emitter-base voltage	open collector	–	6	V
I_C	collector current (DC)		–	1	A
I_{CM}	peak collector current		–	1	A
I_{BM}	peak base current		–	100	mA
P_{tot}	total power dissipation	$T_{amb} \leq 25$ °C	–	800	mW
		$T_{case} \leq 25$ °C	–	5	W
		25 °C < T_{case} < 100 °C	–	2.86	W
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	220	K/W
$R_{th\ j\text{-}c}$	thermal resistance from junction to case		35	K/W

CHARACTERISTICS

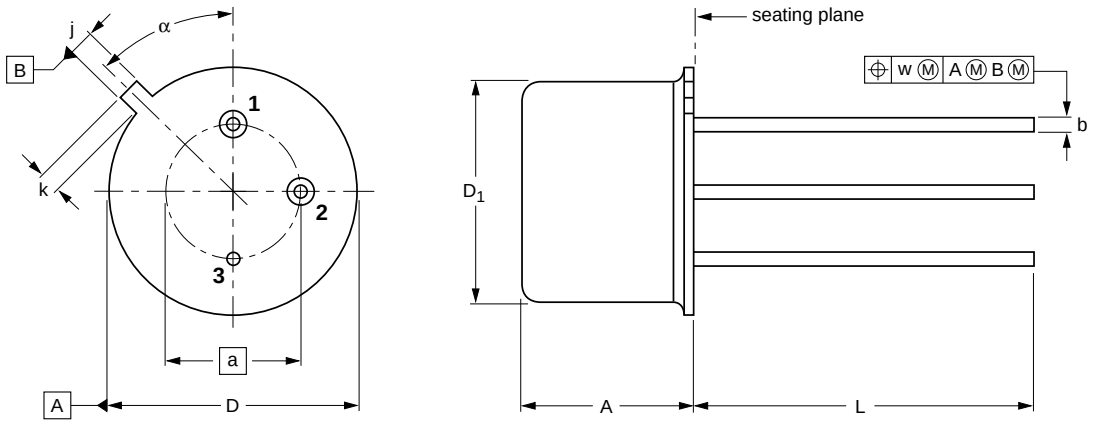
T_j = 25 °C unless otherwise specified.

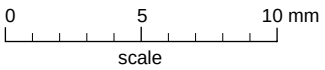
SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{CBO}	collector cut-off current					
	BFY50	I_E = 0; V_{CB} = 60 V	–	–	50	nA
		I_E = 0; V_{CB} = 60 V; T_j = 100 °C	–	–	2.5	µA
		I_E = 0; V_{CB} = 80 V	–	–	500	nA
		I_E = 0; V_{CB} = 80 V; T_j = 100 °C	–	–	30	µA
I_{CBO}	collector cut-off current					
	BFY51	I_E = 0; V_{CB} = 40 V	–	–	50	nA
		I_E = 0; V_{CB} = 40 V; T_j = 100 °C	–	–	2.5	µA
		I_E = 0; V_{CB} = 60 V	–	–	500	nA
		I_E = 0; V_{CB} = 60 V; T_j = 100 °C	–	–	30	µA
I_{CBO}	collector cut-off current					
	BFY52	I_E = 0; V_{CB} = 30 V	–	–	50	nA
		I_E = 0; V_{CB} = 30 V; T_j = 100 °C	–	–	2.5	µA
		I_E = 0; V_{CB} = 40 V	–	–	500	nA
		I_E = 0; V_{CB} = 40 V; T_j = 100 °C	–	–	30	µA
I_{EBO}	emitter cut-off current	I_C = 0; V_{EB} = 5 V	–	–	50	nA
		I_C = 0; V_{EB} = 5 V; T_j = 100 °C	–	–	2.5	µA
		I_C = 0; V_{EB} = 6 V	–	–	500	nA
h_{FE}	DC current gain					
	BFY50	I_C = 10 mA; V_{CE} = 10 V	20	–	–	
		I_C = 150 mA; V_{CE} = 10 V	30	–	–	
		I_C = 500 mA; V_{CE} = 10 V	20	–	–	
		I_C = 1 A; V_{CE} = 10 V	15	–	–	
h_{FE}	DC current gain					
	BFY51	I_C = 10 mA; V_{CE} = 10 V	30	–	–	
		I_C = 150 mA; V_{CE} = 10 V	40	–	–	
		I_C = 500 mA; V_{CE} = 10 V	25	–	–	
		I_C = 1 A; V_{CE} = 10 V	15	–	–	
h_{FE}	DC current gain					
	BFY52	I_C = 10 mA; V_{CE} = 10 V	30	–	–	
		I_C = 150 mA; V_{CE} = 10 V	60	–	–	
		I_C = 500 mA; V_{CE} = 10 V	30	–	–	
		I_C = 1 A; V_{CE} = 10 V	15	–	–	

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
V_{CEsat}	collector-emitter saturation voltage BFY50	I_C = 10 mA; I_B = 1 mA	–	–	200	mV
		I_C = 150 mA; I_B = 15 mA	–	–	200	mV
		I_C = 500 mA; I_B = 50 mA	–	–	700	mV
		I_C = 1 A; I_B = 100 mA	–	–	1	V
V_{CEsat}	collector-emitter saturation voltage BFY51; BFY52	I_C = 10 mA; I_B = 1 mA	–	–	200	mV
		I_C = 150 mA; I_B = 15 mA	–	–	350	mV
		I_C = 500 mA; I_B = 50 mA	–	–	1	V
		I_C = 1 A; I_B = 100 mA	–	–	1.6	V
V_{BEsat}	base-emitter saturation voltage	I_C = 10 mA; I_B = 1 mA	–	–	1.2	V
		I_C = 150 mA; I_B = 15 mA	–	–	1.3	V
		I_C = 500 mA; I_B = 50 mA	–	–	1.5	V
		I_C = 1 A; I_B = 100 mA	–	–	2	V
C_c	collector capacitance	$I_E = i_e$ = 0; V_{CB} = 10 V; f = 1 MHz	–	7	12	pF
f_T	transition frequency BFY50 BFY51; BFY52	I_C = 50 mA; V_{CE} = 10 V; f = 100 MHz; T_{amb} = 25 °C	 60 50	 140 –	 – –	 MHz MHz
Switching times (between 10% and 90% levels)						
t_{on}	turn-on time	I_{Con} = 150 mA; I_{Bon} = 15 mA; I_{Boff} = –15 mA	–	55	–	ns
t_d	delay time		–	15	–	ns
t_r	rise time		–	40	–	ns
t_{off}	turn-off time		–	360	–	ns
t_s	storage time		–	300	–	ns
t_f	fall time		–	60	–	ns

PACKAGE OUTLINE

Metal-can cylindrical single-ended package; 3 leads **SOT5/11**





DIMENSIONS (mm are the original dimensions)

UNIT	A	a	b	D	D_1	j	k	L	w	α
mm	6.60 6.35	5.08	0.48 0.41	9.39 9.08	8.33 8.18	0.85 0.75	0.95 0.75	14.2 12.7	0.2	45°

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT5/11		TO-39				97-04-11

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.	

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