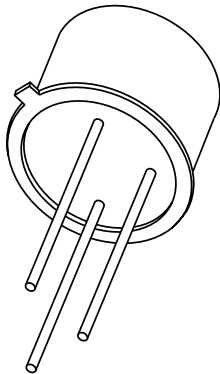


# DATA SHEET



## **BCY78; BCY79** PNP switching transistors

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

1997 Jun 18

# PNP switching transistors

# BCY78; BCY79

### FEATURES

- Low current (max. 100 mA)
- Low voltage (max. 45 V).

### APPLICATIONS

- Switching and amplification.

### DESCRIPTION

PNP switching transistor in a TO-18 metal package.  
NPN complements: BCY58 and BCY59.

### PINNING

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

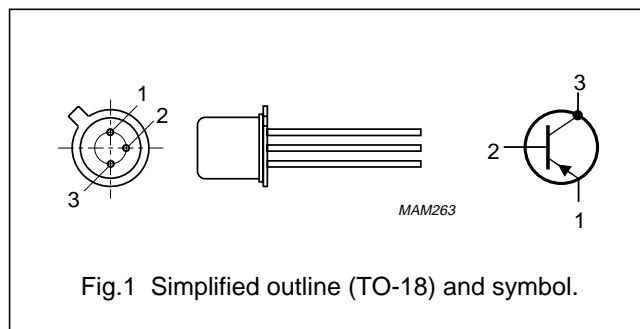


Fig.1 Simplified outline (TO-18) and symbol.

### QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V <sub>CBO</sub>	collector-base voltage	open emitter	-	-32	V
	BCY78			-45	V
V <sub>CEO</sub>	collector-emitter voltage	open base	-	-32	V
	BCY78			-45	V
I <sub>C</sub>	collector current (DC)		-	-100	mA
P <sub>tot</sub>	total power dissipation	T <sub>amb</sub> ≤ 45 °C	-	340	mW
		T <sub>case</sub> ≤ 45 °C	-	1	W
h <sub>FE</sub>	DC current gain	I <sub>C</sub> = -2 mA; V <sub>CE</sub> = -5 V		120	220
	BCY78/VII; BCY79/VII			180	310
	BCY78/VIII; BCY79/VIII			250	460
	BCY78/IX; BCY79/IX			380	630
f <sub>T</sub>	transition frequency	I <sub>C</sub> = -10 mA; V <sub>CE</sub> = -5 V	100	-	MHz
t <sub>off</sub>	turn-off time	I <sub>Con</sub> = -100 mA; I <sub>Bon</sub> = -10 mA; I <sub>Boff</sub> = 10 mA	-	400	ns

## PNP switching transistors

## BCY78; BCY79

**LIMITING VALUES**

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V <sub>CBO</sub>	collector-base voltage	open emitter			
	BCY78		–	–32	V
	BCY79		–	–45	V
V <sub>CEO</sub>	collector-emitter voltage	open base			
	BCY78		–	–32	V
	BCY79		–	–45	V
V <sub>EBO</sub>	emitter-base voltage	open collector		–5	V
I <sub>C</sub>	collector current (DC)		–	–100	mA
I <sub>CM</sub>	peak collector current		–	–200	mA
I <sub>BM</sub>	peak base current		–	–200	mA
P <sub>tot</sub>	total power dissipation	T <sub>amb</sub> ≤ 45 °C	–	340	mW
		T <sub>case</sub> ≤ 45 °C	–	1	W
T <sub>stg</sub>	storage temperature		–65	+150	°C
T <sub>j</sub>	junction temperature		–	200	°C
T <sub>amb</sub>	operating ambient temperature		–65	+150	°C

**THERMAL CHARACTERISTICS**

SYMBOL	PARAMETER	CONDITIONS	VALUE	UNIT
R <sub>th j-a</sub>	thermal resistance from junction to ambient	in free air	450	K/W
R <sub>th j-c</sub>	thermal resistance from junction to case		150	K/W

## PNP switching transistors

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## CHARACTERISTICS

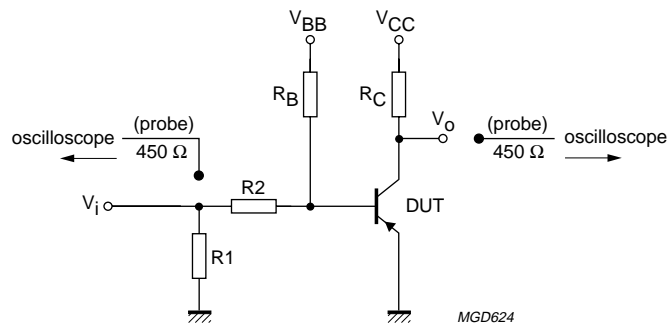
$T_{amb} = 25\text{ °C}$  unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$I_{CBO}$	collector cut-off current BCY78	$I_E = 0; V_{CB} = -32\text{ V}$	–	–2	–15	nA
		$I_E = 0; V_{CB} = -32\text{ V}; T_{amb} = 150\text{ °C}$	–	–	–10	$\mu\text{A}$
$I_{CBO}$	collector cut-off current BCY79	$I_E = 0; V_{CB} = -45\text{ V}$	–	–2	–15	nA
		$I_E = 0; V_{CB} = -45\text{ V}; T_{amb} = 150\text{ °C}$	–	–	–10	$\mu\text{A}$
$I_{EBO}$	emitter cut-off current	$I_C = 0; V_{EB} = -5\text{ V}$	–	–	–20	nA
$h_{FE}$	DC current gain BCY78/VII; BCY79/VII BCY78/VIII; BCY79/VIII BCY78/IX; BCY79/IX BCY78/X	$I_C = -10\text{ }\mu\text{A}; V_{CE} = -5\text{ V}$	–	140	–	
			30	200	–	
			40	270	–	
			100	340	–	
$h_{FE}$	DC current gain BCY78/VII; BCY79/VII BCY78/VIII; BCY79/VIII BCY78/IX; BCY79/IX BCY78/X	$I_C = -2\text{ mA}; V_{CE} = -5\text{ V}$	120	170	220	
			180	250	310	
			250	350	460	
			380	500	630	
$h_{FE}$	DC current gain BCY78/VII; BCY79/VII BCY78/VIII; BCY79/VIII BCY78/IX; BCY79/IX BCY78/X	$I_C = -10\text{ mA}; V_{CE} = -1\text{ V}$	80	180	–	
			120	260	400	
			160	360	630	
			240	500	1000	
$h_{FE}$	DC current gain BCY78/VII; BCY79/VII BCY78/VIII; BCY79/VIII BCY78/IX; BCY79/IX BCY78/X	$I_C = -100\text{ mA}; V_{CE} = -1\text{ V}$	40	–	–	
			45	–	–	
			60	–	–	
			60	–	–	
$V_{CEsat}$	collector-emitter saturation voltage	$I_C = -10\text{ mA}; I_B = -250\text{ }\mu\text{A}$	–	–120	–250	mV
		$I_C = -100\text{ mA}; I_B = -2.5\text{ mA}$	–	–400	–800	mV
$V_{BEsat}$	base-emitter saturation voltage	$I_C = -10\text{ mA}; I_B = -250\text{ }\mu\text{A}$	–600	–700	–850	mV
		$I_C = -100\text{ mA}; I_B = -2.5\text{ mA}$	–700	–850	–1200	mV
$V_{BE}$	base-emitter voltage	$I_C = -10\text{ }\mu\text{A}; V_{CE} = -5\text{ V}$	–	–550	–	mV
		$I_C = -2\text{ mA}; V_{CE} = -5\text{ V}$	–600	–650	–750	mV
		$I_C = -10\text{ mA}; V_{CE} = -1\text{ V}$	–	–650	–	mV
		$I_C = -100\text{ mA}; V_{CE} = -1\text{ V}$	–	–750	–	mV
$C_c$	collector capacitance	$I_E = i_e = 0; V_{CB} = -10\text{ V}; f = 1\text{ MHz}$	–	–	7	pF
$C_e$	emitter capacitance	$I_C = i_c = 0; V_{EB} = -500\text{ mV}; f = 1\text{ MHz}$	–	–	15	pF
$f_T$	transition frequency	$I_C = -10\text{ mA}; V_{CE} = -5\text{ V}; f = 100\text{ MHz}$	100	–	–	MHz

PNP switching transistors

BCY78; BCY79

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
F	noise figure	$I_C = -200 \mu\text{A}$ ; $V_{CE} = -5 \text{ V}$ ; $R_S = 2 \text{ k}\Omega$ ; $f = 1 \text{ kHz}$ ; $B = 200 \text{ Hz}$	-	-	10	dB
<b>Switching times (between 10% and 90% levels); see Fig.2</b>						
$t_{on}$	turn-on time	$I_{Con} = -10 \text{ mA}$ ; $I_{Bon} = -1 \text{ mA}$ ; $I_{Boff} = 1 \text{ mA}$ ; test conditions A	-	-	100	ns
$t_d$	delay time		-	-	50	ns
$t_r$	rise time		-	-	50	ns
$t_{off}$	turn-off time		-	-	700	ns
$t_s$	storage time		-	-	600	ns
$t_f$	fall time		-	-	100	ns
$t_{on}$	turn-on time	$I_{Con} = -100 \text{ mA}$ ; $I_{Bon} = -10 \text{ mA}$ ; $I_{Boff} = 10 \text{ mA}$ ; test conditions B	-	-	100	ns
$t_d$	delay time		-	-	35	ns
$t_r$	rise time		-	-	65	ns
$t_{off}$	turn-off time		-	-	400	ns
$t_s$	storage time		-	-	300	ns
$t_f$	fall time		-	-	100	ns



**Test conditions A**

$V_i = -5 \text{ V}$ ;  $T = 500 \mu\text{s}$ ;  $t_p = 10 \mu\text{s}$ ;  $t_r = t_f \leq 3 \text{ ns}$ .  
 $R_1 = 56 \Omega$ ;  $R_2 = 2.5 \text{ k}\Omega$ ;  $R_B = 3.9 \text{ k}\Omega$ ;  $R_C = 270 \Omega$ .  
 $V_{BB} = 1.9 \text{ V}$ ;  $V_{CC} = -3 \text{ V}$   
 Oscilloscope input impedance  $Z_i = 50 \Omega$ .

**Test conditions B**

$V_i = -9.8 \text{ V}$ ;  $T = 500 \mu\text{s}$ ;  $t_p = 10 \mu\text{s}$ ;  $t_r = t_f \leq 3 \text{ ns}$ .  
 $R_1 = 62 \Omega$ ;  $R_2 = 470 \Omega$ ;  $R_B = 470 \Omega$ ;  $R_C = 100 \Omega$ .  
 $V_{BB} = 3.4 \text{ V}$ ;  $V_{CC} = -10.8 \text{ V}$   
 Oscilloscope input impedance  $Z_i = 50 \Omega$ .

Fig.2 Test circuit for switching times.

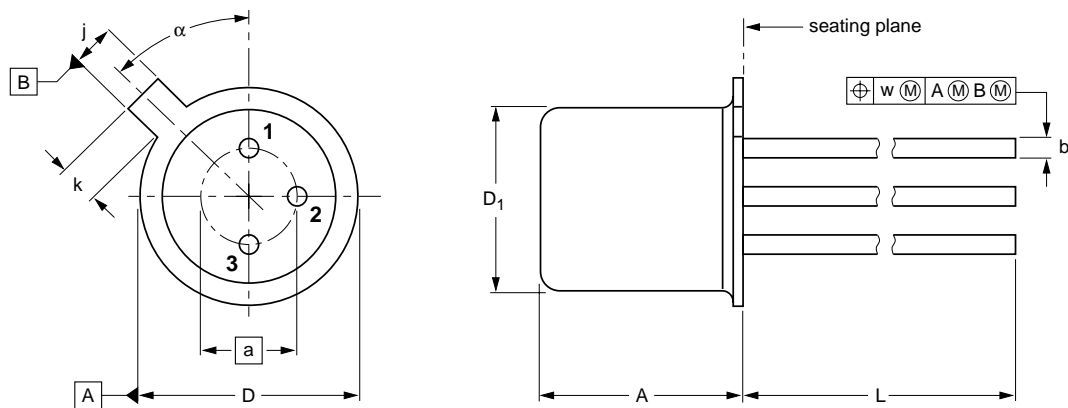
PNP switching transistors

BCY78; BCY79

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 <sub>1</sub>	j	k	L	w	$\alpha$
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

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**PNP switching transistors****BCY78; BCY79**

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<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.	
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