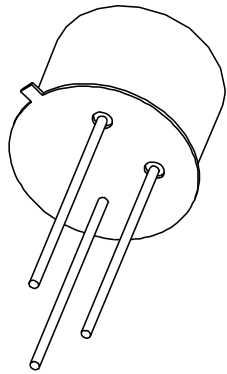


# DATA SHEET



## **2N4031; 2N4033** PNP medium power transistors

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

1997 May 22

# PNP medium power transistors

# 2N4031; 2N4033

### FEATURES

- High current (max. 1 A)
- Low voltage (max. 80 V).

### APPLICATIONS

- Audio frequency applications for industrial service.

### DESCRIPTION

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

### PINNING

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

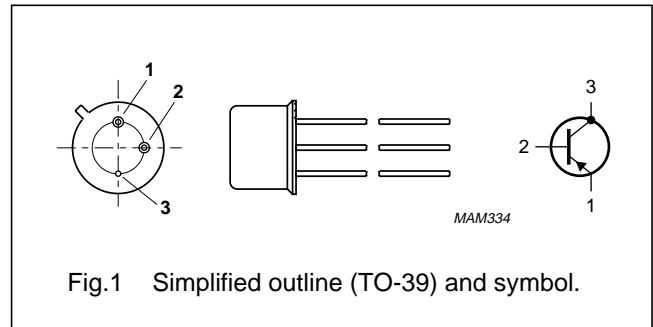


Fig.1 Simplified outline (TO-39) and symbol.

### QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
$V_{CBO}$	collector-base voltage	open emitter	–	–80	V
$V_{CEO}$	collector-emitter voltage	open base	–	–80	V
$I_{CM}$	peak collector current		–	–1.5	A
$P_{tot}$	total power dissipation	$T_{amb} \leq 25\text{ }^\circ\text{C}$	–	0.8	W
$h_{FE}$	DC current gain	$I_C = -500\text{ mA}; V_{CE} = -5\text{ V}$			
	2N4031		25	–	
	2N4033		70	–	
$f_T$	transition frequency	$I_C = -50\text{ mA}; V_{CE} = -10\text{ V}; f = 100\text{ MHz}$			
	2N4031		100	400	MHz
	2N4033		150	500	MHz

## PNP medium power transistors

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**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	–	–80	V
$V_{CEO}$	collector-emitter voltage	open base	–	–80	V
$V_{EBO}$	emitter-base voltage	open collector	–	–5	V
$I_C$	collector current (DC)		–	–1	A
$I_{CM}$	peak collector current		–	–1.5	A
$I_{BM}$	peak base current		–	–0.2	A
$P_{tot}$	total power dissipation	$T_{amb} \leq 25\text{ °C}$	–	0.8	W
		$T_{case} \leq 25\text{ °C}$	–	4	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
$R_{th\ j-a}$	thermal resistance from junction to ambient	in free air	218	K/W
$R_{th\ j-c}$	thermal resistance from junction to case		44	K/W

## PNP medium power transistors

## 2N4031; 2N4033

**CHARACTERISTICS**

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
$I_{CBO}$	collector cut-off current	$I_E = 0; V_{CB} = -60\text{ V}$	–	–50	nA
		$I_E = 0; V_{CB} = -60\text{ V}; T_{amb} = 150\text{ °C}$	–	–50	$\mu\text{A}$
$I_{EBO}$	emitter cut-off current	$I_C = 0; V_{EB} = -5\text{ V}$	–	–10	$\mu\text{A}$
$h_{FE}$	DC current gain 2N4031	$V_{CE} = -5\text{ V}$			
		$I_C = -100\text{ }\mu\text{A}$	30	–	
		$I_C = -100\text{ mA}$	40	120	
		$I_C = -100\text{ mA}; T_{amb} = -55\text{ °C}$	15	–	
		$I_C = -500\text{ mA}$	25	–	
$h_{FE}$	DC current gain 2N4033	$V_{CE} = -5\text{ V}$			
		$I_C = -100\text{ }\mu\text{A}$	75	–	
		$I_C = -100\text{ mA}$	100	300	
		$I_C = -100\text{ mA}; T_{amb} = -55\text{ °C}$	40	–	
		$I_C = -500\text{ mA}$	70	–	
$V_{CEsat}$	collector-emitter saturation voltage	$I_C = -150\text{ mA}; I_B = -15\text{ mA}$	–	–150	mV
		$I_C = -500\text{ mA}; I_B = -50\text{ mA}$	–	–500	mV
$V_{BEsat}$	base-emitter saturation voltage	$I_C = -150\text{ mA}; I_B = -15\text{ mA}; \text{note 1}$	–	–900	mV
$V_{BE}$	base-emitter voltage	$I_C = -500\text{ mA}; V_{CE} = -0.5\text{ V}; \text{note 1}$	–	–1.1	V
$C_c$	collector capacitance	$I_E = i_e = 0; V_{CB} = -10\text{ V}; f = 1\text{ MHz}$	–	20	pF
$C_e$	emitter capacitance	$I_C = i_c = 0; V_{EB} = -0.5\text{ V}; f = 1\text{ MHz}$	–	110	pF
$f_T$	transition frequency 2N4031 2N4033	$I_C = -50\text{ mA}; V_{CE} = -10\text{ V}; f = 100\text{ MHz}$	100	400	MHz
			150	500	MHz
<b>Switching times (between 10% and 90% levels)</b>					
$t_{on}$	turn-on time	$I_{Con} = 500\text{ mA}; I_{Bon} = -50\text{ mA};$ $I_{Boff} = 50\text{ mA}$	–	100	ns
$t_{off}$	turn-off time		–	400	ns

**Note**

1. Pulse test:  $t_p \leq 300\text{ }\mu\text{s}$ ;  $\delta \leq 0.01$ .

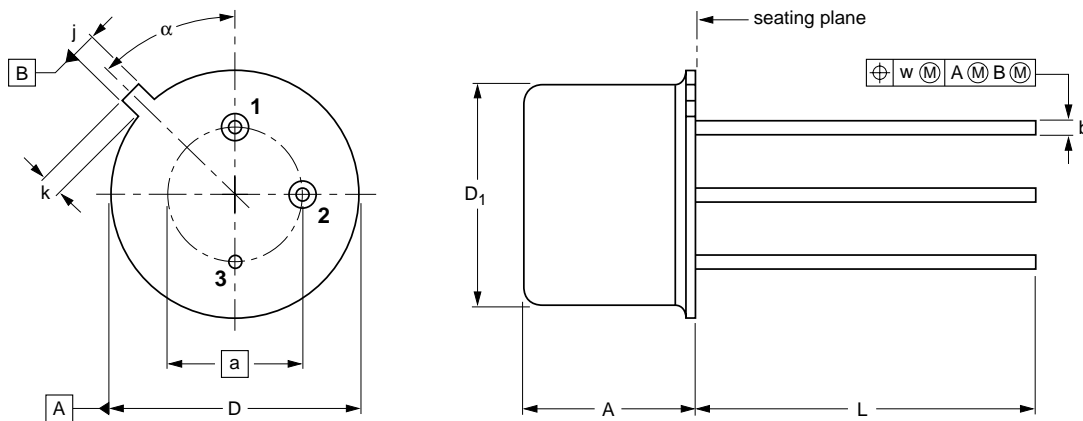
PNP medium power transistors

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PACKAGE OUTLINE

Metal-can cylindrical single-ended package; 3 leads

SOT5/11



DIMENSIONS (mm are the original dimensions)

UNIT	A	a	b	D	D <sub>1</sub>	j	k	L	w	$\alpha$
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

## PNP medium power transistors

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**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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