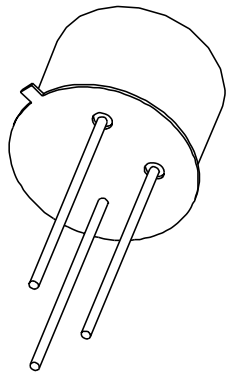


# DATA SHEET



## **2N2219; 2N2219A** **NPN switching transistors**

Product specification  
Supersedes data of 1997 May 07  
File under Discrete Semiconductors, SC04

1997 Sep 03

# NPN switching transistors

# 2N2219; 2N2219A

### FEATURES

- High current (max. 800 mA)
- Low voltage (max. 40 V).

### APPLICATIONS

- High-speed switching
- DC and VHF/UHF amplification, for 2N2219 only.

### DESCRIPTION

NPN switching transistor in a TO-39 metal package.  
PNP complement: 2N2905 and 2N2905A.

### PINNING

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

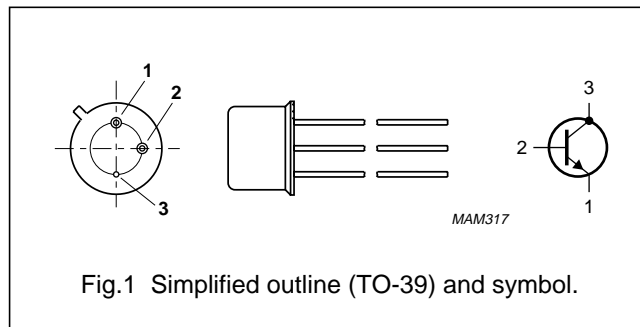


Fig.1 Simplified outline (TO-39) and symbol.

### QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V <sub>CBO</sub>	collector-base voltage	open emitter			
	2N2219		–	60	V
	2N2219A		–	75	V
V <sub>CEO</sub>	collector-emitter voltage	open base			
	2N2219		–	30	V
	2N2219A		–	40	V
I <sub>C</sub>	collector current (DC)		–	800	mA
P <sub>tot</sub>	total power dissipation	T <sub>amb</sub> ≤ 25 °C	–	800	mW
h <sub>FE</sub>	DC current gain	I <sub>C</sub> = 10 mA; V <sub>CE</sub> = 10 V	75	–	
f <sub>T</sub>	transition frequency	I <sub>C</sub> = 20 mA; V <sub>CE</sub> = 20 V; f = 100 MHz			
	2N2219		250	–	MHz
	2N2219A		300	–	MHz
t <sub>off</sub>	turn-off time	I <sub>Con</sub> = 150 mA; I <sub>Bon</sub> = 15 mA; I <sub>Boff</sub> = –15 mA	–	250	ns

## NPN switching transistors

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**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 2N2219 2N2219A	open emitter	–	60	V
			–	75	V
V <sub>CEO</sub>	collector-emitter voltage 2N2219 2N2219A	open base	–	30	V
		open base; I <sub>C</sub> ≤ 500 mA	–	40	V
V <sub>EBO</sub>	emitter-base voltage 2N2219 2N2219A	open collector	–	5	V
			–	6	V
I <sub>C</sub>	collector current (DC)		–	800	mA
I <sub>CM</sub>	peak collector current		–	800	mA
I <sub>BM</sub>	peak base current		–	200	mA
P <sub>tot</sub>	total power dissipation	T <sub>amb</sub> ≤ 25 °C	–	800	mW
		T <sub>case</sub> ≤ 25 °C	–	3	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	190	K/W
R <sub>th j-c</sub>	thermal resistance from junction to case		50	K/W

## NPN switching transistors

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## CHARACTERISTICS

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
$I_{CBO}$	collector cut-off current 2N2219	$I_E = 0; V_{CB} = 50\text{ V}$	–	10	nA
		$I_E = 0; V_{CB} = 50\text{ V}; T_{amb} = 150\text{ °C}$	–	10	$\mu\text{A}$
$I_{CBO}$	collector cut-off current 2N2219A	$I_E = 0; V_{CB} = 60\text{ V}$	–	10	nA
		$I_E = 0; V_{CB} = 60\text{ V}; T_{amb} = 150\text{ °C}$	–	10	$\mu\text{A}$
$I_{EBO}$	emitter cut-off current	$I_C = 0; V_{EB} = 3\text{ V}$	–	10	nA
$h_{FE}$	DC current gain	$I_C = 0.1\text{ mA}; V_{CE} = 10\text{ V}$	35	–	
$h_{FE}$	DC current gain	$I_C = 1\text{ mA}; V_{CE} = 10\text{ V}$	50	–	
$h_{FE}$	DC current gain	$I_C = 10\text{ mA}; V_{CE} = 10\text{ V}$	75	–	
$h_{FE}$	DC current gain 2N2219A	$I_C = 10\text{ mA}; V_{CE} = 10\text{ V}; T_{amb} = -55\text{ °C}$	35	–	
$h_{FE}$	DC current gain	$I_C = 150\text{ mA}; V_{CE} = 1\text{ V}; \text{note 1}$	50	–	
$h_{FE}$	DC current gain	$I_C = 150\text{ mA}; V_{CE} = 10\text{ V}; \text{note 1}$	100	300	
$h_{FE}$	DC current gain 2N2219 2N2219A	$I_C = 500\text{ mA}; V_{CE} = 10\text{ V}; \text{note 1}$	30	–	
			40	–	
$V_{CEsat}$	collector-emitter saturation voltage 2N2219 2N2219A	$I_C = 150\text{ mA}; I_B = 15\text{ mA}; \text{note 1}$	–	400	mV
			–	300	mV
$V_{CEsat}$	collector-emitter saturation voltage 2N2219 2N2219A	$I_C = 500\text{ mA}; I_B = 50\text{ mA}; \text{note 1}$	–	1.6	V
			–	1	V
$V_{BEsat}$	base-emitter saturation voltage 2N2219 2N2219A	$I_C = 150\text{ mA}; I_B = 15\text{ mA}; \text{note 1}$	–	1.3	V
			0.6	1.2	V
$V_{BEsat}$	base-emitter saturation voltage 2N2219 2N2219A	$I_C = 500\text{ mA}; I_B = 50\text{ mA}; \text{note 1}$	–	2.6	V
			–	2	V
$C_c$	collector capacitance	$I_E = I_e = 0; V_{CB} = 10\text{ V}$	–	8	pF
$C_e$	emitter capacitance 2N2219A	$I_C = I_c = 0; V_{EB} = 500\text{ mV}$	–	25	pF
$f_T$	transition frequency 2N2219 2N2219A	$I_C = 20\text{ mA}; V_{CE} = 20\text{ V}; f = 100\text{ MHz};$	250	–	MHz
			300	–	MHz
F	noise figure 2N2219A	$I_C = 0.2\text{ mA}; V_{CE} = 5\text{ V}; R_S = 2\text{ k}\Omega;$ $f = 1\text{ kHz}; B = 200\text{ Hz}$	–	4	dB

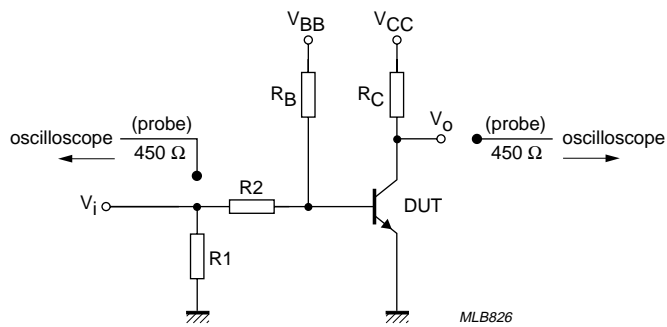
NPN switching transistors

2N2219; 2N2219A

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
<b>Switching times (between 10% and 90% levels) for type 2N2219A; see Fig.2</b>					
$t_{on}$	turn-on time	$I_{Con} = 150 \text{ mA}; I_{Bon} = 15 \text{ mA};$ $I_{Boff} = -15 \text{ mA}$	–	35	ns
$t_d$	delay time		–	15	ns
$t_r$	rise time		–	20	ns
$t_{off}$	turn-off time		–	250	ns
$t_s$	storage time		–	200	ns
$t_f$	fall time		–	60	ns

**Note**

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



$V_i = 9.5 \text{ V}; T = 500 \mu\text{s}; t_p = 10 \mu\text{s}; t_r = t_f \leq 3 \text{ ns}.$   
 $R_1 = 68 \Omega; R_2 = 325 \Omega; R_B = 325 \Omega; R_C = 160 \Omega.$   
 $V_{BB} = -3.5 \text{ V}; V_{CC} = 29.5 \text{ V}.$   
 Oscilloscope: input impedance  $Z_i = 50 \Omega.$

Fig.2 Test circuit for switching times.

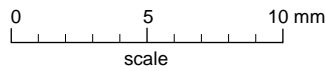
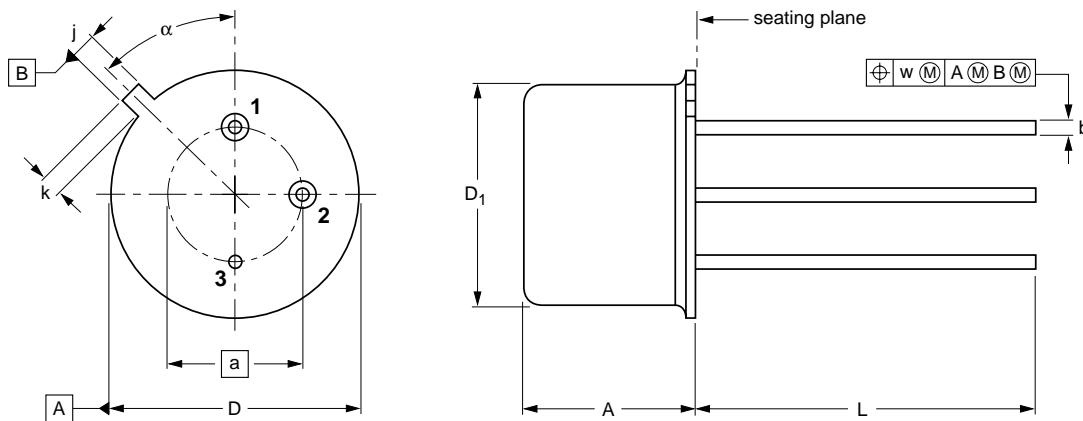
NPN switching transistors

2N2219; 2N2219A

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

## NPN switching transistors

2N2219; 2N2219A

**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.	
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