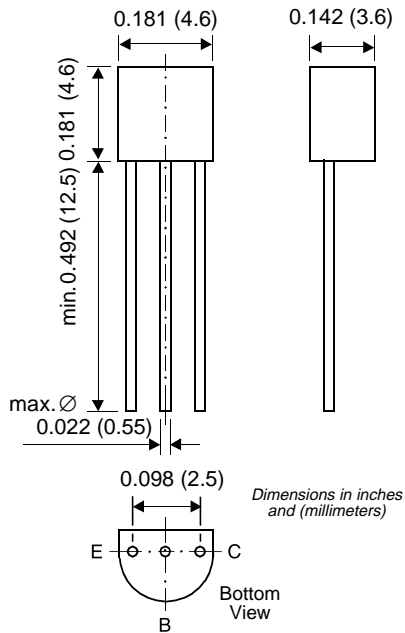


**Small Signal Transistor (PNP)**



*New Product*

**TO-226AA (TO-92)**



**Features**

- PNP Silicon Epitaxial Planar Transistor for switching and amplifier applications.
- As complementary type, the NPN transistor 2N3904 is recommended.
- On special request, this transistor is also manufactured in the pin configuration TO-18.
- This transistor is also available in the SOT-23 case with the type designation MMBT3906.

**Mechanical Data**

**Case:** TO-92 Plastic Package

**Weight:** approx. 0.18g

**Packaging Codes/Options:**

E6/Bulk - 5K per container

E7/4K per Ammo tape

**Maximum Ratings & Thermal Characteristics** Ratings at 25°C ambient temperature unless otherwise specified.

Parameters	Symbols	Value	Units
Collector-Emitter Voltage	-V <sub>CEO</sub>	40	V
Collector-Base Voltage	-V <sub>CBO</sub>	40	V
Emitter-Base Voltage	-V <sub>EBO</sub>	5.0	V
Collector Current	-I <sub>C</sub>	200	mA
Power Dissipation	P <sub>tot</sub>	625 1.5	mW W
Thermal Resistance Junction to Ambient Air	R <sub>θJA</sub>	250 <sup>(1)</sup>	°C/W
Junction Temperature	T <sub>j</sub>	150	°C
Storage Temperature Range	T <sub>s</sub>	- 65 to +150	°C

**Notes:** (1) Valid provided that leads are kept at ambient temperature.

**Small Signal Transistor (PNP)**
**Electrical Characteristics** ( $T_J = 25^\circ\text{C}$  unless otherwise noted)

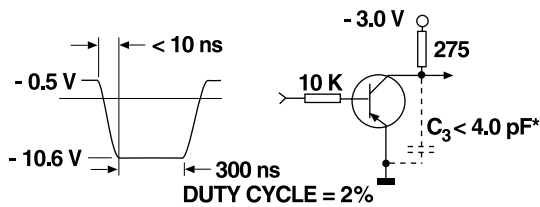
Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
DC Current Gain	$h_{FE}$	$-V_{CE} = 1\text{ V}, -I_C = 0.1\text{ mA}$	60	—	—	—
		$-V_{CE} = 1\text{ V}, -I_C = 1\text{ mA}$	80	—	—	
		$-V_{CE} = 1\text{ V}, -I_C = 10\text{ mA}$	100	—	300	
		$-V_{CE} = 1\text{ V}, -I_C = 50\text{ mA}$	60	—	—	
		$-V_{CE} = 1\text{ V}, -I_C = 100\text{ mA}$	30	—	—	
Collector-Emitter Cutoff Current	$-I_{CEV}$	$-V_{EB} = 3\text{ V}, -V_{CE} = 30\text{ V}$	—	—	50	nA
Emitter-Base Cutoff Current	$-I_{EBV}$	$-V_{EB} = 3\text{ V}, -V_{CE} = 30\text{ V}$	—	—	50	nA
Collector Saturation Voltage	$-V_{CEsat}$	$-I_C = 10\text{ mA}, -I_B = 1\text{ mA}$	—	—	0.25	V
		$-I_C = 50\text{ mA}, -I_B = 5\text{ mA}$	—	—	0.4	
Base Saturation Voltage	$-V_{BEsat}$	$-I_C = 10\text{ mA}, -I_B = 1\text{ mA}$	—	—	0.85	V
		$-I_C = 50\text{ mA}, -I_B = 5\text{ mA}$	—	—	0.95	
Collector-Emitter Breakdown Voltage	$-V_{(BR)CEO}$	$-I_C = 1\text{ mA}, I_B = 0$	40	—	—	V
Collector-Base Breakdown Voltage	$-V_{(BR)CBO}$	$-I_C = 10\text{ }\mu\text{A}, I_E = 0$	40	—	—	V
Emitter-Base Breakdown Voltage	$-V_{(BR)EBO}$	$-I_E = 10\text{ }\mu\text{A}, I_C = 0$	5	—	—	V
Input Impedance	$h_{ie}$	$-V_{CE} = 10\text{ V}, -I_C = 1\text{ mA},$ $f = 1\text{ kHz}$	1	—	10	k $\Omega$
Voltage Feedback Ratio	$h_{re}$	$-V_{CE} = 10\text{ V}, -I_C = 1\text{ mA},$ $f = 1\text{ kHz}$	$0.5 \cdot 10^{-4}$	—	$8 \cdot 10^{-4}$	—
Current Gain-Bandwidth Product	$f_T$	$-V_{CE} = 20\text{ V}, -I_C = 10\text{ mA}$ $f = 100\text{ MHz}$	250	—	—	MHz
Collector-Base Capacitance	$C_{CBO}$	$-V_{CB} = 5\text{ V}, f = 100\text{ kHz}$	—	—	4.5	pF
Emitter-Base Capacitance	$C_{EBO}$	$-V_{EB} = 0.5\text{ V}, f = 100\text{ kHz}$	—	—	10	pF
Small Signal Current Gain	$h_{fe}$	$-V_{CE} = 10\text{ V}, -I_C = 1\text{ mA}$ $f = 1\text{ kHz}$	100	—	400	—
Output Admittance	$h_{oe}$	$-V_{CE} = 1\text{ V}, -I_C = 1\text{ mA}$ $f = 1\text{ kHz}$	1	—	40	$\mu\text{S}$

**Small Signal Transistor (PNP)**

**Electrical Characteristics** ( $T_J = 25^\circ\text{C}$  unless otherwise noted)

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
Noise Figure	NF	$-V_{CE} = 5\text{ V}$ , $-I_C = 100\ \mu\text{A}$ , $R_G = 1\ \text{k}\Omega$ , $f = 10\text{...}15000\ \text{Hz}$	—	—	4	dB
Delay Time (see fig. 1)	$t_d$	$-I_{B1} = 1\ \text{mA}$ , $-I_C = 10\ \text{mA}$	—	—	35	ns
Rise Time (see fig. 1)	$t_r$	$-I_{B1} = 1\ \text{mA}$ , $-I_C = 10\ \text{mA}$ ,	—	—	35	ns
Storage Time (see fig. 2)	$t_s$	$I_{B1} = -I_{B2} = 1\ \text{mA}$ , $-I_C = 10\ \text{mA}$	—	—	225	ns
Fall Time (see fig. 2)	$t_f$	$I_{B1} = -I_{B2} = 1\ \text{mA}$ , $-I_C = 10\ \text{mA}$	—	—	75	ns

**Fig. 1:** Test circuit for delay and rise time  
\* total shunt capacitance of test jig and connectors



**Fig. 2:** Test circuit for storage and fall time  
\* total shunt capacitance of test jig and connectors

